

Online Formative Assessment in Higher Education: Enhancing Continuing Teacher Education in E-Learning

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by

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Dedication

This work is dedicated to:

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Online Formative Assessment in Higher Education: Enhancing Continuing Teacher Education in E-Learning

Abstract

Assessment is a key aspect within teaching and learning processes in higher education (Torrance, 2007). Formative assessment may be viewed simply as constructive feedback to support learning or more holistically as ongoing assessment based on sustained engagement in learning activities within a supportive social context that expand teachable moments to scaffold learning. Online education now pervades higher education worldwide but effective ways to incorporate formative assessment within online settings is not well understood. Previous research in online postgraduate courses designed for teachers as professional learners illustrate that engagement with authentic learning activities promotes meaningful learning and transferability to their communities of practice (COP) (e.g. Mackey, 2011). However, there appears to be paucity of literature with a focus on assessment in professional learning.

This thesis explores formative assessment within online postgraduate courses designed for teachers as professional learners who aim to develop capacity to incorporate information communication technologies (ICT) in their own practice. Case studies are presented to richly illustrate the design, implementation and evaluation of the effectiveness of two courses; and then further re-examined to elucidate strategies and key characteristics that can foster (or hinder) online formative assessment. Authentic and developmental learning perspectives underpinned by situated cognition theory framed the design and interpretation within a multiple-case methodology. Evidence of experiences and perceptions of the teachers and their professional students included online observation, analysis of the discourse, and semi-structured interviews.

An authentic learning environment that sustained productive engagement is illustrated in both case studies along with many techniques that the teachers designed to underpin formative assessment. A key characteristic in both courses was the design of authentic assessment activities that are relevant and meaningful in real-life contexts. Techniques identified included appropriate learner autonomy, and opportunities to negotiate shared understanding of learning goals and expected outcomes including the sharing of student-created artefacts. The online reification of the artefacts and other learning community support was enabled by the ongoing documentation through creative use of online discussion forums

as a feature within the learning management system (LMS). These techniques enriched the processes of ongoing monitoring, assessment of evidence of learning and interactive formative feedback. Both teachers' beliefs about self and peer feedback also enabled both teachers to design for productive synergies between formative and summative assessment that promoted engagement and deep learning. Additional synergies of discourse among peers related to immediacy, interactivity, and mutuality in which the students recognized themselves and valued their peers as source of constructive feedback. The students also demonstrated meaningful reflectivity that manifested reflexivity within the context of their professional practices.

Online formative assessment is illustrated in both courses as a form of collaborative engagement in authentic learning, including assessment activities with opportunities for ongoing interactions and formative feedback. The open-ended authentic assessment activities supported professional learners to connect the online discourse to their own classroom practices, as well as keenly engage with authentic projects that are situated in their schools. Learner autonomy stimulated self-regulated learning in which students went beyond achievement of the expected learning outcomes for summative assessment to engaging with tasks and processes that matched their own learning goals, interests and contextual needs. Learners' involvement within formative assessment processes enhanced opportunities to negotiate meanings which fostered shared authenticity. The inherent authenticity in the course design also stimulated application of prior knowledge and experiences in ways that promoted meaningful learning. Engagement in asynchronous dialogue as a community of learners with shared goals and practice elicited alternative perspectives and disorienting dilemmas. This stimulated learners to think in new ways and more critically and to develop relevant professional competencies in ICT. These in turn supported teachers as professional learners to confidently apply their developing pedagogical practices with ICT in their own classrooms; and to share those with school colleagues.

This study illustrates ways that online formative assessment can be designed to support learners to develop relevant knowledge and professional skills that increase professional competencies. Incorporating authentic formative assessment in the course design also impacted teachers' continuing professional development (CPD), and thus their schools. A key finding from this research is conceptualization of formative assessment as a collaborative pedagogical strategy in which both the teacher and students are active players. This research provides evidence that innovative integration of formative assessment in online settings can support committed professional learners to develop competencies that are transferable into

their own practice. This suggests that ongoing formative assessment is an important strategy to increase the quality of online professional development in many fields, in addition to that of education.

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Chapter 1

1.0 General introduction

1.1 Background and the significance of the current study

The rapid evolution of the Internet and World Wide Web (WWW) from the 1990s is stimulating changes in all sectors and economies globally. The opportunities arising from ubiquitous web-based information and communication technologies (ICT) are changing how learning and teaching occur at all levels of education in ways that were inconceivable a few decades ago (Garrison & Akyol, 2009; Picciano, 2009). However, effective application of ICT in education continues to be a challenge worldwide (Garrison & Akyol, 2009).

The uptake of ICT by higher education institutions has continued to increase worldwide (Garrison & Akyol, 2009). Most higher education institutions, particularly universities, are equipped with sophisticated ICT linked to broadband internet connection (Ellis, Ginns, & Piggott, 2009). Higher education advancements in ICT innovations have the potential to shape and enhance learning experiences in ways that could improve learning outcomes (Ellis et al., 2009). As clarified in the following chapter, variety of terminology has been used in the literature to refer to the use of web-based ICT in education including e-learning, blended learning, and online learning. The advent of WWW has supported the growth of online and blended learning in higher education as a way to promote learning (Garrison & Akyol, 2009; Picciano, 2009). However, it can also hinder learning when used inappropriately and the fundamental issues of how this affects learning environments are not critically addressed (Garrison & Akyol, 2009).

There is growing acceptance that online and blended learning has the potential to enhance higher education through supporting learners to go beyond mastering standard content domains to understanding and utilizing available information in highly dynamic multifaceted environments (Chung, Shel, & Kaiser, 2006; Garrison & Akyol, 2009). According to Garrison and Akyol (2009), use of ICT to enable online and blended learning have been perceived as a catalyst in the transformation to engaged learning necessary for success in the 21st century as well as an element for sustaining change and coping with further change. However, this has not necessarily transformed pedagogical approaches (Alampay, 2006; Ellis et al., 2009; Garrison & Akyol, 2009). That is, ICT is mainly being used to sustain or support existing pedagogical approaches as opposed to being used to transform teaching and learning. Similarly, the growth of online learning in higher education has not been

accompanied by necessary shift in pedagogical approaches; which is apparently a challenge for educators because they tend to carry on with some traditional pedagogical practices that do not fit online classrooms (Baran, Correia, & Thompson, 2011). The design of online teaching and learning appears to call for distinctive pedagogical considerations when compared to face-to-face settings.

The design of online courses appears to be more productive when underpinned by pedagogical approaches that are learner and assessment centred (Mackey, 2009; Sorensen & Takle, 2005; Vonderwell, Liang, & Alderman, 2007). These studies showed that online learning could be more effective when educators designed active, personalized and contextualized learning environments. This implies that online learning requires paradigm shift in pedagogical approaches in order to enable innovative use of the increasing web-based ICT to promote learners' active engagement (Vonderwell et al., 2007). Garrison and Akyol (2009) identified that the emerging ICT-mediated pedagogical approaches do not always lead to achieving learner-focused environments in which the teacher is perceived as facilitator and learners are actively engaged in the learning processes. Naidu (2009) also suggested that the 21st century learning in which ICT is prevalent necessitates a shift from pre-specified content structures to customized pedagogical approaches. That is, while it is still important to observe the curricula scope, strict predefinition of the boundary of what may be relevant in a particular subject domain is less essential. It is therefore important to refocus on new pedagogical approaches that will capture the potential of ICT affordances to promote learning.

The prevalence of information rich environments has provided opportunities to achieve learner-focused approaches and acquire information 'in time of need' as opposed to 'in case of need'. Moreover, universities are confronting challenges which are divergent and complex, partially because of the needs of the 21st century; which is being regarded as the 'century of knowledge' or the knowledge society, in which information and knowledge are changing more rapidly than any other time in history (Nwachukwu & Olofube, 2006). Consideration of such perspectives supports adoption of learner-focused pedagogies in an effort to meet the professional development needs of the knowledge society that require learners to develop their ability to apply knowledge, skills and judgement in diverse ill-structured contexts. This is particularly important in teacher education because teachers are continuously faced with changing needs of diverse learners within their own professional practices (Gillard, Bailey, & Nolan, 2008).

Various researchers suggest that teacher education is fundamental to the future of society (Davis, Preston, & Sahin, 2009); Fisher, Higgins & Loveless, 2006; Gillard et al.,

2008; Pecheone, Pigg, Chung, & Souviney, 2005). Realization of desirable educational outcomes calls for more vigilance in teacher education. Teachers play an important role in educational change particularly in relation to effective use of instructional ICT (Davis et al., 2009). In the same vein, teacher education in ICT-related professional development is fundamental to the knowledge society in which technology has become prominent. For sustainable change to occur, teachers must not only embrace change, but they must also become agents of change (Fullan, 1993; Gillard et al., 2008). In the light of developing relevant ICT knowledge and skills, teachers need to accept that they need to keep improving their competencies in order to meet the changing needs of their learners (Gillard et al., 2008). Gillard et al. noted that if we are to realize and sustain change in education, we must first change the way the teachers learn so that they learn to think like 21st century teachers and develop abilities that will enable them to effectively identify and address the changing needs of 21st century learners. This is to say, teachers need to develop self-regulated learning dispositions and become life-long learners. According to the National Academy in the USA, it is essential for teachers as continuing professional learners to develop and/or improve relevant skills and self awareness of effective classroom practices that can promote students' learning experiences (Bransford, Brown, & Cocking, 2000), particularly through effective integration of ICT into their own professional practice.

There is increasing interest among researchers and educational practitioners in the effort to meet professional development needs of the 21st century learners. The design of learning environments influences students' experiences in fundamental way (Bransford et al., 2000; Naidu, 2009). It is essential for an effectively designed learning environment to prevail for meaningful learning to occur. Meaningful learning in this context is conceptualized as learning that is robust and transferable to real-life professional practices and contexts (Herrington, Reeves, & Oliver, 2006; Mackey, 2009). Effectively designed learning environments are centred on the following elements: knowledge, learner, assessment and community (Bransford et al., 2000), who state that an effective learning environment is:

- a) *Knowledge centred* by being designed in ways that focus on explicitly defined disciplinary contexts coupled with clear learning goals and outcomes. In addition, knowledge centeredness also requires providing learners with appropriate opportunities to develop deep understanding of the course content and other relevant skills. Opportunities to apply existing knowledge and experiences are also important in promoting contextualized knowledge building.

b) Learner centred by being congruent with individual learner's strengths, interests and contextual experiences in ways that actively and meaningfully engage learners.

c) Assessment centred through providing learners with adequate opportunities to demonstrate their developing abilities and illuminate their learning needs, and opportunities to receive ongoing formative feedback to support them to improve their understandings and achievements.

d) Community centred by offering learners dynamic opportunities for interacting and sharing their understanding of content and expected outcomes through collaborating with others whom they share common goals.

Therefore, assessment is one of the most influential factors that affect learning in formal settings (Bransford et al., 2000; Chung et al., 2006; Jenkins, 2005). Assessment is a key component in the design of a learning environment, both in online and face-to-face learning contexts. Empirical research within online learning contexts has also shown that learner and assessment centred dimensions are antecedent to knowledge centeredness which is the key goal in higher education (e.g. Sorensen & Takle, 2005; Vonderwell et al., 2007). Similarly, community centeredness is crucial to promote the other three elements particularly through fostering interactive collaborations among the students, and between students and the teacher.

Learner and assessment centred approaches can provide a framework for shifting from the traditional view of passive learning to active learning (Vonderwell et al., 2007) that is relevant to the 21st century learning. Bransford et al. (2000) argued that active and contextualized learning is particularly crucial in teacher education as a means to facilitate meaningful learning experiences. Reinforcing this, various researchers indicate that an assessment centred focus can facilitate an authentic learning environment particularly for teachers as professional learners to support them engage more actively and meaningfully (Feldman & Capobianco, 2008; Shepard, 2000). Authentic learning contexts are particularly valuable in promoting meaningful professional development for continuing (or in-service) teachers (Mackey, 2009). Creating authentic learning environment relates to designing online courses in ways that support learners' engagement with authentic activities that are appropriately complex and have real-world relevance to actively engage learners in meaningful learning (Herrington, Reeves, & Oliver, 2006). Engaging learners with activities that relate to real-life situations and experiences can support teachers to develop competencies that are transferable to their own professional practice (Mackey, 2009). To achieve such desirable learning environments, it is important for teacher education to go beyond the

concept of '*assessment of learning*' and coherently incorporate innovative pedagogical approaches that emphasize assessment as an integral part of teaching and learning processes, thus *assessment for learning* (Bransford et al., 2000; Shepard, 2000). Emphasis on assessment for learning can promote meaningful interactions and collaborations between the teacher and students, and among students which in turn increase opportunities for ongoing assessment and formative feedback in online settings (Sorensen & Takle, 2005; Vonderwell et al., 2007). In these ways, assessment can contribute to learning through fostering adequate learning support, and scaffold in ways that recognize the needs and experiences of diverse online learners.

The two concepts of '*assessment of learning*' and '*assessment for learning*' become clearer by considering the distinction between the two main forms of assessment. Summative assessment (*assessment of learning*) is applied at the end of stipulated period (such as end of course or programme) for purposes of accreditation (grading and/or certification), while formative assessment (*assessment for learning*) is applied on ongoing basis for purposes of promoting learning (Oosterhof, Conrad, & Ely, 2008). Various researchers emphasize that pedagogical approaches in which assessment is part of teaching and learning process that integrate formative assessment as a way to enhance the design of learning environments (Challis, 2005; Gaytan & McEwen, 2007; Ozden, Erturk, & Sanli, 2004; Shepard, 2000; Vonderwell et al., 2007). According to these researchers, productive education requires appropriate alignment among teaching, learning and assessment in order to adequately meet the rapidly evolving needs for professional learners in the knowledge society.

Assessment for both formative and summative purposes is an important aspect in higher education as a way of establishing that learning goals and expected outcomes are being achieved (Chung et al., 2006; Khare & Lam, 2008). The concept of formative assessment is based on three core processes that are fundamental to assessment for learning as conceptualized by various authors (Black & Wiliam, 2009; Hattie & Jaeger, 1998; Sadler, 1989). These processes are: "establishing where the learners are in their learning; establishing where they are going; and establishing what needs to be done to get them there" (Black & Wiliam, 2009, p. 7). It is the convergence of formative assessment and the affordances of online learning settings that lead to the concept of online formative assessment. Therefore, online formative assessment is conceptualized in the current study as the use of web-based ICT to support the iterative processes of establishing what, how much and how well students are learning. These processes aim to inform tailored formative feedback and scaffold learning with respect to the learning goals and expected outcomes. As it will emerge through the

findings of this study in latter chapters, application of online formative assessment as a pedagogical strategy is more productive when responsibilities are shared among the teacher, peers and the individual learner.

It is apparent that application of formative assessment in online environments has the potential to increase opportunities for interactive collaborations (among the individual learner, peers and the teacher), and formative feedback in ways that support learners to engage in meaningful ways. Following a comprehensive review of related literature as presented in Chapter 2 and published in Gikandi, Morrow, and Davis (2011), such learning opportunities appear to be scarce particularly in online learning settings, and where available, their potential may not be fully exploited (Gikandi et al., 2011). Some researchers have also pointed out that online formative assessment has received little attention despite its potential in promoting learning in higher education, in general (Chung et al., 2006), and in teacher education in particular (Feldman & Capobianco, 2008). These studies recommend more emphasis on online formative assessment in order to achieve effective assessment strategies that can support achievement of desirable learning outcomes. Furthermore, effective online formative assessment strategies are not obvious to many educators (Gikandi et al., 2011). It is therefore important to enhance existing understandings about how formative assessment can be best applied in order to realize its potential in promoting meaningful online learning.

1.1.1 Problem statement

There is substantial research with a focus on authentic activities and how this may engage professional learners meaningfully within online contexts. Recent empirical research indicates that engaging learners with open-ended authentic activities has the potential to enable learner and assessment centred focus in online learning settings (Mackey, 2009; Mackey & Evans, 2011). Although Mackey's and related studies focused on how teachers were engaged with authentic projects within their communities of practice (COP), their findings appear to suggest that online continuing professional development (CPD) can be designed in ways that promote learning experiences for professional online learners and promote transferability to a COP that is external to the course. This suggests that it is important for educators to design for personalized and customized learning environments in order to support continuing professionals to achieve their learning goals and needs. Other studies within online settings have also identified the need to design for authentic activity and learner autonomy which relates to allowing the "learners have some control over what they attempt to learn and when, [this can] maximize the chance that they will be able to relate new knowledge to prior

experience” (Martens, Bastiaens, & Kirschner, 2007, p. 83). These researchers indicated the importance of creative pedagogical designs to stimulate professional learners to apply their prior knowledge and experiences; and support them to go beyond achievement of standardized course goals to meeting their own learning goals, interests and contextualized needs. Such designs can enable online learning to go beyond increasing access to higher education to supporting professional learners to develop transferable knowledge and skills for increased professional competencies and life-long learning.

Formative assessment is particularly relevant in enabling adequate assessment of both processes and products of authentic learning (Oosterhof et al., 2008), which is a valuable aspect in professional learning (Mackey, 2009, 2011). Some researchers have also suggested that assessment has potential to promote meaningful learning particularly by designing ongoing assessment that measures both what the learners know and their potential for further development (Khare & Khare; Torrance, 2007). Moreover, the increasing growth of CPD within online settings indicates the need for robust understandings informed by empirical research about how assessment of situated and authentic learning can be enhanced to increase productivity in professional education. However, a comprehensive review of available literature revealed scarcity of studies with a focus on assessment in professional online learning particularly from the perspective of designing for situated and authentic learning. Furthermore, the existing research has mainly focused on online assessment in higher education in general without adequate attention to assessment within the contexts of online CPD. Application of formative assessment within online and blended CPD contexts has potential to promote meaningful learning but it has not been adequately researched (Feldman & Capobianco, 2008; Pachler, Daly, Mor, & Mellar, 2010). The review of literature also revealed that most of the previous research has a focus on application of online formative assessment within blended learning contexts where the students and the teachers have some opportunities for face-to-face interactions. The few existing studies (e.g. Sorenson & Takle, 2005; Vonderwell et al.; 2007) within the online context appear to have limited scope in terms of the techniques of formative assessment they exemplify. This notwithstanding, these studies indicate the potential of formative assessment in online learning contexts within which classroom interactions are mainly asynchronous.

The reviewed literature also uncovered scarcity of research on application of online formative assessment from a holistic approach. This is particularly in regard to systematic investigation into the design, implementation of multiple techniques and evaluation of the effectiveness of formative assessment within online CPD settings. This study adopted a

systematic approach to investigate application of online formative assessment within the contexts of ICT-related CPD for teachers. A systematic research approach within the context of e-learning (online education) is one that focuses on investigating the convergence of theoretical, pedagogical and technological perspectives (Herrington, 2006). Such an approach is useful to enhance rigour and usefulness of the findings, especially in supporting educators to make well-informed decisions and achieve innovative pedagogical designs. Informed by insights drawn from the literature, conceptualizing application of formative assessment from authentic learning theoretical perspectives seemed a viable way to maximize its potential within the context of online CPD.

To some extent it appears that the value of formative assessment has only been recognized from the perspective of providing learners with opportunities for formative feedback as a means of supporting learning. However, it is important to go beyond this notion and reconceptualize formative assessment from a more holistic approach in order to maximize its productivity. Formative assessment is more effective when applied as an ongoing process in order to best support developmental learning (Clark, 2010; Khare & Lam, 2008) that emphasizes creation of negotiated teachable moments and offer opportunities for ongoing learning scaffold (Khoo & Cowie; 2011; Pachler et al., 2010). As Torrance (2007) argued, formative assessment in higher education requires a ‘divergent approach’. Torrance noted that formative assessment is more productive when it goes beyond providing formative feedback based on standard goals and expected outcomes to incorporate a broader focus that is “more oriented towards identifying what students can do in an open-ended and exploratory fashion [in ways that also] strengthen the development of learner autonomy” (Torrance, 2007, p. 291). Such an approach is important in higher and professional learning because it is crucial to promote meaningful learning.

To address the gaps identified above, the current study specifically sought to investigate application of formative assessment in online courses where design was founded on situated and authentic learning perspectives and the use of multiple techniques. In addition, this research critically examined how this promoted meaningful online learning and assessment for the continuing teachers as professional learners.

1.2 Research question and design

The current study sought to contribute to the understanding of how to effectively apply formative assessment in online learning in order to enhance learning experiences and outcomes in continuing teacher education within the context of ICT-related professional

development. The design and implementation of online formative assessment was systematically investigated in two postgraduate online courses. Furthermore, this study sought to establish how this promoted meaningful learning and its ongoing assessment within the context of ICT education for continuing teachers. In particular, this study addressed the following key research question: ***How can online formative assessment enhance learning experiences in ICT education for teachers?***

The study was guided by the following related sub-questions:

1. In what ways does online formative assessment support meaningful learning?
2. What strategies (core and emerging) for online formative assessment are evident in the studied courses?
3. What are the related issues of concern?
4. What are the key characteristics for effective online formative assessment?

In order to answer these research questions, the researcher specifically sought to understand and elucidate four aspects within each case study and across them as follows:

Firstly, the way in which each teacher (also as the course designer) in each of the two selected online courses integrated formative assessment within the course design, how this was implemented (the evident strategies) to support meaningful learning, and the teachers' pedagogical philosophy and approach that informed their decisions. This aspect relates to both sub-questions 1 and 2, which sought to explore the evident strategies for formative assessment that supported meaningful learning in both case studies as reported in Chapter 6. The strategies are explored within individual case findings in Chapter 4 and 5, and further analyzed in Section 6.4.2.

Secondly, the way in which teacher in each course experienced and perceived students' learning experiences and outcomes in relation to achievement of their learning goals and the expected outcomes. This aspect relates to sub-question 1 in regard to how formative assessment promoted meaningful learning from the teacher's perspective. This aspect also focuses on explicating the key issues of concern that may hinder and/or reduce the benefits of formative assessment in online courses (Section 6.4.3).

Thirdly, the meanings (experiences and perceptions) that the students gained from their respective course(s). This aspect overarches the 4 research sub-questions. It focuses on elucidating the students' involvement in the learning and formative assessment processes. The meaningful learning experiences that became evident are illustrated, as well the challenges and concerns that the students experienced. This aspect was also useful in identifying and

summarizing the key characteristics that contributed to the effectiveness of formative assessment (sub-question 4 as addressed in Section 6.4.4).

Fourthly, in order to achieve broader meanings with respect to the existing body of knowledge and practices, this research went further to elucidate and interpret the current findings in relation to prior empirical research and broader theoretical understandings. This in turn offered sound basis to draw credible conclusions from the findings and articulate implications for practice that may guide educators, including teachers, in the application of online formative assessment.

The researcher applied case study methodology underpinned by a pragmatic paradigm that was biased towards a qualitative interpretive approach. A multi-case embedded design was adopted in which two online courses within a postgraduate programme in a New Zealand University were selected as suitable cases. The evidence presented in this thesis was obtained using multiple data collection techniques including online observations, archival and artefact analysis of the course discourse, and semi structured interviews. Data analysis techniques entailed inductive and deductive processes that encompassed three phases: (a) data reduction, (b) data display, and (c) drawing data conclusions and verifications (Miles & Huberman, 1994).

1.3 The context and relevance of this research

As noted earlier, the affordances of online learning have coincided with increased demand for professional development in various disciplines. Like other professionals, teachers have continued to seek further education with an aim to enhance their knowledge and skills. The role of formal online learning in supporting CPD has been widely recognized (Lai, 1999; Crisp & Ward, 2008; Mackey, 2011; Kirschner & Lai, 2007; Lai, Pratt, Anderson, & Stigter, 2006; Morrow, 2007; Naidu, 2003; Sorensen, 2005; Trewern & Lai, 2001). Online higher education learning is particularly viable for teachers as professional learners because it fits in their work demands and personal commitments. Online learning can support teachers' professional development in ways that "allows sufficient time to absorb and effect change, [that] is ongoing and recurring and...embedded in teacher work, that has an emphasis on student learning and that makes use of teacher experiences" (Morrow, 2007, p. 6). Concurring with Lai et al.'s (2006) viewpoints, effective CPD in the context of the current study relates to an ongoing process of development (whether in formal or informal settings) that support teachers to engage meaningfully, and stimulate them to share, reflect upon and evolve their own professional practices. An important question though, is how online courses in formal

CPD settings can be designed to support teachers as professional learners to meaningfully engage and develop transferable competencies. As reported in this thesis, the key focus of this research was to address this question.

CPD programmes within formal distance settings had been in existence in many nations worldwide even before the advent of online learning. The emergence of online learning in New Zealand (NZ) universities has evolved through various generations of distance learning (Lai, 1999; Trewern & Lai, 2001) that are consistent with those articulated by Oosterhof et al. (2008). These generations include distance learning enhanced with ICT; and its eventual growth to the current state of online learning supported by the WWW and high bandwidth Internet connections. The growth of online learning continues to pose a challenge to most higher education institutions in regard to supporting professional learners to achieve their professional development ambitions. Teachers are among other professionals who enrol in online programmes within universities across the world for their CPD.

New Zealand like many other developed nations worldwide has continued to invest substantially in sophisticated technologies in various sectors including education. The aim is to increase access to hardware, software and Internet resources in educational institutions (New Zealand Ministry of Education, 2008). Availability of these resources coupled with other related initiatives is aimed to stimulate use of ICT for educational improvements. One outcome from these developments is continued growth of online learning within NZ higher education institutions particularly universities. In the effort to achieve educational needs of the knowledge society, the NZ government has committed to supporting teachers' CPD in ICT as one way of fast tracking e-learning developments in schools (New Zealand Ministry of Education, 2008; 2010; 2011). These initiatives, in part, have motivated continuing teachers to enrol in ICT-related professional development programmes within NZ universities (Mackey, McGrath, & Davis, 2010).

The increasing support for ICT-related CPD for teachers in NZ suggests that the Ministry of Education has recognized that effective integration of ICT into teaching and learning will depend on the individual teacher's capability to apply ICT affordances in a way that is pedagogically sound to create learning environments that engage learners in meaningful ways. Therefore, NZ education policies appear to recognize the role of teachers as key agents of change in education. Teachers in primary and secondary schools across NZ are increasingly seeking professional development opportunities in ICT education through pursuing postgraduate programmes within NZ universities. A number of online teacher educators worldwide have demonstrated leadership and commitment to explore and

implement innovative pedagogical designs that would support teachers as continuing professional learners to engage more meaningfully and to develop competencies that are relevant to their own professional practices and contexts.

Integration of formative assessment within authentic online learning environments was recognized by both educators (teachers) of the two selected online courses as a pedagogical strategy that could support them to achieve the programme goals in relation to designing for effective ICT-related professional development for continuing teachers. Guided by the programme goals, one of these educators (teacher in Case 1) who had also been the programme leader noted that application of online formative assessment was an innovative pedagogical strategy that fitted well with the pedagogical philosophies and approaches desirable in both online courses. This is because these educators deemed integration of formative assessment as a viable way to create safe and authentic learning environments for their learners (particularly as professional teachers) to articulate, share, explore and try out various possibilities about effective uses of ICT for teaching and learning as they interact with others, particularly the teacher and peers (Mackey, personal communication, 2011). In addition, these educators identified integration of formative assessment as a way to stimulate their students to reflect and make connections to real-life applications in ways that could support development of robust ICT knowledge and skills that were transferable to their own professional practices and contexts. As illustrated later in the findings, application of formative assessment was also deemed by these educators as a means to support their students to achieve the course goals and expected outcomes while also focusing on individual learners' goals, interests, and needs. Both teachers also expected that integration of formative assessment in their course design would support them to capitalize on learners' diverse prior experiences and knowledge, and prompt learners as active learning resource for themselves and their peers particularly as a collaborative learning community with common professional knowledge and/or experiences.

The context of this research as described in this chapter, in part, is what stirred this study. The researcher was also enthused by her interest as a tertiary educator in a developing country to contribute to the ways in which the quality of online learning can be promoted in both developed and developing nations. As a researcher, I choose an institution within a developed nation (NZ) where online learning and particularly in ICT education for teachers is more mature, when compared to most developing nations. This was particularly a rich context because both online educators had demonstrated leadership in ICT-related professional development for teachers. Framed within this context, the focus of this research was informed

by the insights drawn from the review of related literature as introduced in Section 1.1 and analyzed in detail in the following chapter.

1.4 Thesis structure

This thesis is presented through eight chapters. **Chapter 1** gives the introduction that describes the importance of carrying out this research and the knowledge gap that the current study aimed to address. **Chapter 2** presents a review of relevant literature that informed the current study mainly focusing on application of formative assessment within online learning contexts. The chapter examines prior related research to illuminate the relevance of formative assessment in online learning and how it functions in online contexts. The review of the literature also sought to understand foundational issues in assessment including the core concepts of validity and reliability, and the theoretical underpinnings that guided this study. **Chapter 3** offers a description and rationale for the applied research method and design, and provides the underlying philosophical foundations. Chapter 3 also details the methodological techniques employed in data collection and analysis. **Chapters 4 and 5** describe the two online courses (Case 1 and 2 respectively). Each of these chapters focuses on how formative assessment was integrated in each of the two courses by presenting a description of the case context followed by specific methodological procedures applied in data collection and analysis. These chapters also present individual case findings in which results are detailed and discussed with a focus on specific elements of formative assessment that became evident in each course; and the extent to which these supported meaningful learning and its ongoing assessment. In **chapter 6**, the findings of both case studies are converged through a cross-case analysis that sought to achieve holistic understanding of the findings. The chapter presents a synthesis of the key findings with respect to the research questions. **Chapter 7** presents conceptual interpretations of the findings by generalizing the key findings to broader theory; and advancing a theoretical framework. The chapter also explicates the key contributions of the current study relative to empirical literature. **Chapter 8** as the final chapter brings all of the research together starting with wider overview of the research context, significance and focus including a synopsis of the findings before drawing out implications for practice and conclusions based on the key research findings. The chapter also presents the study limitations/delimitations and offers recommendations for future research.

Chapter 2

2.0 Literature Review

2.1 Introduction

This chapter focuses on understanding application of online formative assessment through a critical review of the related literature. The reviewed literature informed the focus of this study and also provided a benchmark for linking the research findings to the existing knowledge. The chapter starts by providing a brief overview of assessment in higher education in general and in online learning in particular, the review procedure and clarification of key terminologies in this field. The chapter proceeds to examine the role of formative assessment in online higher education with respect to addressing the fundamental issues of assessment such as aspects of validity and reliability. It then focuses on examining the functionality of online formative assessment including review of the benefits and strategies of online formative assessment that are evident in the literature. Following that review, the chapter examines theoretical underpinnings that can provide a suitable foundation for productive online formative assessment. Finally, conceptual principles for effective online formative assessment are identified as the key findings emerging from the related literature and broader theoretical underpinnings.

This chapter has now been published in a peer reviewed journal (Gikandi et al., 2011). The chapter mainly (except Sections 2.2.1, 2.2.2 and 2.9) presents the analysis related literature as published in Gikandi et al. (2011). The reviewed literature as reported in the publication has so far been amended to fit the purposes of this thesis. Although the researcher focused on reviewing both conceptual and empirical literature that was relevant to application of formative assessment in higher education, she was also keen to consider other related literature with general focus. The researcher drew on the available literature from a wide range of higher education disciplines within online and blended contexts. This was partly due to scarcity of literature with a specific focus on application of formative assessment in online settings. Additionally, some aspects in the wider literature were relevant across a variety of fields, and in face-to-face, blended and online learning context. Most of the selected empirical studies were in teacher education while others were multidisciplinary or in specific fields such as health, business and science education.

2.2 Higher education and computer-supported pedagogical approaches

Online and blended learning have become common place in 21st century higher education. Larreamendy-Joerns and Leinhardt (2006) review of the literature “observed two complementary movements in the educational landscape: the merging of online teaching and learning into the stream of everyday practices at universities, and the increasingly salient role of distance programs in institutions of higher education” (p. 572). Talent-Runnels et al (2006) reviewed course environment, learners’ outcomes, learners’ characteristics, and institutional and administrative factors. In critiquing the available literature, they identified that “asynchronous communication seemed to facilitate in-depth communication (but not more than in traditional classes), students liked to move at their own pace, learning outcomes appeared to be the same as in traditional courses, and students with prior training in computers were more satisfied with online courses” (p. 93). Correspondingly, computer-supported collaborative learning (CSCL) continues to be recognized as an important pedagogical approach in formal education. In particular, CSCL has been identified as one approach that can promote flexible thinking and learning skills, which are important in supporting learners to engage in higher-order learning and robust knowledge building (Hämäläinen & Häkkinen, 2010; Mukama, 2010; Wegerif, 2006). In the following subsection, a brief review of the literature on CSCL is provided in order to highlight its key role in higher education.

2.2.1 Overview of CSCL in higher education

It is apparent that CSCL is a core approach that underpin many pedagogical strategies within higher education in general, and within online and blended learning contexts in particular (Hiltz, 1995; Mason & Bacsich, 1998; Salmon, 2004; So & Bonk, 2010). As Wegerif’s (2006) study indicates, CSCL has become a common pedagogical approach with the emergence of networked society that is mainly characterized by electronic networks and WWW. As previous studies affirm, it is necessary to consider pedagogical paradigms and strategies that align well with electronic networks as a medium of teaching and learning in the context of CSCL (So & Bonk, 2010; Wegerif, 2006). The key focus in CSCL is to promote social learning in which development of ‘space of a dialogue’ that is situated within a relevant context is emphasized (Wegerif, 2006). In such dialogic spaces,

For each participant in a dialogue the voice of the other is an outside perspective that includes them within it. The boundary between subjects is not therefore a demarcation line, or an external link between self and other, or a tool of any kind, but an inclusive “space” of dialogue

within which self and other mutually construct and re-construct each other. (Wegerif, 2006, p. 44)

Consistent with various studies (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007; Hämäläinen & Häkkinen, 2010; Wegerif, 2006), an editorial review by Stahl (2010) also suggests that CSCL is centred within dialogical interactions and its power emanates from its potential to coalesce multiple perspectives of individual participants. That is, the power of collaborative learning comes from “the pooling of different knowledge and alternative perspectives distributed within the group” (Stahl, 2010, p. 257). As Stahl suggests, different paradigms, strategies and tools can be adopted in CSCL but one key aspect that is necessary for development of desirable interactive collaborations is building of mutual trust and cohesion within a group. Sustained interactions is a critical socio cognitive process for facilitate collaborative learning particularly within online settings (Garrison, Anderson, & Archer, 2000; Hiltz, 1995; Mason & Bacsich, 1998; Salmon, 2004). As reported in Dewiyanti et al. (2007), a study within the context of distance education, such environments within CSCL are also beneficial in overcoming the physical isolation between students and teachers. According to Dewiyanti et al. use of an asynchronous CSCL environment is recommended in distance education above a synchronous CSCL environment because it allows flexibility in terms of time to read, reflect and compose responses.

According to the findings of Hämäläinen and Häkkinen (2010), effective CSCL can facilitate shared knowledge construction where participants cumulatively share knowledge together, and CSCL also stimulates them to be built on others' ideas and thoughts within authentic learning contexts. Hämäläinen and Häkkinen's findings were based on a case study research within the context of online learning and comprised a group of 30 teacher education students. The findings of this study illustrated that CSCL promoted authentic learning as the students engaged collaboratively in problem-solving. However, their findings also show that the degree to which productive collaborative learning is realized depends on how students in a particular group are able to engage in elaborative questioning, mutual explanations and reasoning. This implies that different groups in the same classroom context may require different kind of support in their collaborative interactions (Hämäläinen & Häkkinen, 2010).

Recent research further indicates that teacher can support students to engage more productively within CSCL environments by utilizing appropriate scaffolding strategies (Mukama, 2010). Mukama's findings within the context of teacher education in blended settings also suggest that teacher's scaffolding can foster peer-peer learning support. As findings of previous studies (Mukama, 2010; Romero & Lambropoulos, 2011) indicate,

despite the needed guidance and support, it is also important that teacher's role be appropriately facilitative in way that does not hinder students' autonomy and interdependence as they develop new knowledge collaboratively. Such CSCL environments support students to become more creative and self-regulated in ways that promotes deep learning.

Moreover, the findings of Hämäläinen and Häkkinen (2010) also indicate that productive CSCL requires educators to account for both group and individual learning. It is therefore important to seek appropriate strategies to monitor and assess learning within CSCL processes (Hämäläinen & Häkkinen, 2010; Persico, Pozzi, & Sarti, 2010; Prins, Sluijsmans, Kirschner, & Strijbos, 2005). As the findings of Prins et al. (2005) indicates, CSCL environments can be enhanced by incorporating formative assessment strategies, for example, peer formative assessment. The following sub-section provides an overview of assessment in higher education.

2.2.2 Brief overview on assessment in higher education

Assessment is at the heart of higher education. As noted by Torrance (2007), assessment is a key component within teaching and learning. It is important to note that although formative assessment (assessment to support learning) and summative assessment (for validation and accreditation) are not separate or fixed processes, tension continue to exist between them (William & Black, 1996). Assessment can also be deeply embedded in pedagogy for both formative and summative purposes. For instance, previous research emphasizes embedded assessment and indicates that level of the knowledge structure being developed have implications for assessment strategies (Gijbels, Dochy, Bossche, & Segers, 2005). Recent studies have also shown that embedding authentic activities while also providing opportunities for ongoing interactions with others are key in promoting meaningful learning (Mackey, 2009; Mackey & Evans, 2011).

As Vonderwell et al. (2007) indicated, assessment (whether formative or summative) in online learning contexts encompasses distinct characteristics as compared to face-to-face contexts particularly due to the asynchronous nature of interactivity among the online participants (the teacher and learners). It therefore requires educators to rethink online pedagogy in order to innovatively integrate formative assessment in ways that support meaningful (higher-order or deep) learning and ongoing assessment (Vonderwell et al., 2007). Sustained interactions and collaborations within online settings are critical sociocognitive process necessary for facilitating development of critical thinking skills, a desirable outcome in formal higher education (Akyol, Garrison, & Ozden, 2009; Kehrwald, 2010). However, as

Akyol et al. (2009) identified, it is challenging to develop effective learning environments that foster interactive collaborations in online settings because this requires well-structured strategies that are not always obvious to many educators.

Integration of formative processes in online learning environments has the potential to foster meaningful interactive collaborations among learners and the teacher in ways that can promote meaningful learning (Sorensen & Takle, 2005). Moreover, formative assessment has the potential to provide a structure for adequate learning support and scaffold through the processes of ongoing monitoring of learning, assessment of evidence of learning and provision of formative feedback. The literature reviewed by Hattie and Timperly (2007), and Nicol and Macfarlane (2006), although not specific to online learning contexts, further indicated that feedback is most effective when highly related to clearly identified learning goals. This implies offering formative feedback that is based on specific goals while also focusing on supporting students to develop effective learning strategies.

Interactive collaborations among the teacher and learners are essential in fostering opportunities for ongoing learning support and scaffolding in online learning (Ludwig-Hardman & Dunclop, 2003). Such opportunities enable learners to engage productively and assists them in the development of self-regulated learning dispositions. This in turn stimulates them to take primary responsibility for their learning and assessment which are important requirements for success in online learning. This implies that, sustained meaningful interactions and collaborations among the individual learner, peers and the teacher as a supportive learning community with shared purpose can foster meaningful engagement and deep learning. Following this viewpoint, application of formative assessment in online learning environments was identified in this research as an innovative pedagogical strategy that can facilitate such valuable opportunities.

In online higher and professional education, however, emphasis continues to be placed on summative assessment with formative assessment receiving little attention despite its crucial role in promoting learning (Pachler et al., 2010; Wang, Wang & Huang, 2008). These researchers recommended more emphasis on application of formative assessment in online settings as a way of creating learner and assessment centred learning environments. Before proceeding to the analysis of related literature, the following sections presents the procedure applied in reviewing the literature in this study, followed by clarification of key terminologies.

2.3 Procedure applied in reviewing the literature

As Boote and Beile (2005) suggested, there is need to understand previous related studies, their strengths, weaknesses, and implications in order to advance collective understanding and lead to valuable research, and thus the need for a systematic process in reviewing related literature. In this study, the researcher employed systematic qualitative criteria to allow rigorous analysis, critique and synthesis of related literature (Green, Johnson, & Adams, 2006; Pan, 2008, pp. 1-5; Torraco, 2005). The literature reviewing process in this study involved the three main steps of literature review as articulated in Galvan (2006), which are searching, reviewing and writing the literature review. Gikandi et al. (2011) describes these steps and related procedures were followed in reviewing the literature examined in this chapter; and Appendix 1.A provides an overview of the systematic processes followed in critical review of the related literature. The writing of this review was particularly informed by critical analyze of the contexts, methodological approaches, strengths and weaknesses, key findings, implications and conclusions of the relevant empirical studies. The researcher was also keen to examine the theoretical approaches and pedagogical strategies that were evident in these studies. The conceptual literature was also examined to identify relevant themes and perspectives.

2.4 Key terminologies as conceptualized in the context of this study

Guri-Rosenelt (2009) has extensively discussed the importance of terminology clarification especially in educational domains. Various terminologies have been used synonymously or varyingly defined by different authors in this field. In this study some of the key terms to distinguish include *e-learning*, *online* and *blended learning*. In describing the varying terms that are used to refer to applications of digital technologies in education, Guri-Rosenelt (2009) noted that more than twenty terms are synonymously used with the term *e-learning*. In particular, the author noted that the term *e-learning* is widely used synonymously with the term *online learning* among other terms. While many definitions of *e-learning* appear in the literature, it can be broadly and sufficiently defined as any learning and/or teaching delivered or conducted through Information Communication Technology (ICT) of any kind, thus encompassing such various digital technologies including CD-ROM, television, interactive multimedia, mobile phones, and the Internet (Andrews & Haythornthwaite, 2007; Brenton, 2009; Guri-Rosenelt, 2009; Mellor, 2008). Based on these authors, e-learning covers a range of practices including online learning, blended learning, ICT mediated f2f, and distance

learning. These terms are of relevance to this field, thus making it necessary to draw a clear distinction among them.

According to Guri-Rosenelt (Guri-Rosenelt, 2009), *distance learning* refers to any form of learning where teaching and learning activities are distributed across time and space and does not require the teacher and the student to be gathered in the same place and time. *Online learning* refers to a form of distance education primarily conducted through web-based ICT (Guri-Rosenelt, 2009). Dabbagh and Bannan-Ritland (2005) define *online learning* as “distance learning environments that use Internet and/or web-based technologies to support the teaching and learning process” (p. 15). Consistent with these definitions, Allen, Seaman, and Garret (2007) of the Sloan Consortium group U.S. defined online learning as a form of e-learning that is enabled by web-based technologies, does not require the teacher and the learner to be available at the same time and place, and constitutes 80% or more learning/teaching activities conducted through web-based ICT. These authors also defined *blended learning* as learning environments where 30-80% of learning/teaching activities are conducted through web-based ICT. This study adopts the definitions by Allen et al. (2007).

It is also necessary to define the term *assessment* which is defined as measurement of the learner’s achievement and progress in a learning process (Keeves, 1994; Reeves & Hedberg, 2009). Often, the term *assessment* is used synonymously with the term *evaluation*, which at times leads to ambiguity. It is thus necessary to draw a clear distinction between these concepts and related terms in this review. Although both terms have a component of measurement, it is desirable to reserve the term *evaluation* for operations associated with measuring worthiness/value of non-person entities (such as curricula, programmes, courses, instructional strategies among others) in relation to identified goals, while the term *assessment* is used to refer to operations associated with measuring achievements of an individual person(s) in relation to desirable outcomes (Keeves, 1994). Wellington (2008) defines evaluation as “systematic investigation of worth of an innovation, initiative, policy or a programme. It is used to measure the effectiveness or impact of an intervention or initiative” (p. 236). In this review, the term *assessment* is purposefully used to refer to measurement of learner’s achievement and progress in a learning process. Two major forms of assessment exist: formative and summative assessments (Challis, 2005; Oosterhof et al., 2008).

Summative assessment measures what students have learned at the end of an instructional unit, end of a course, or after some defined period (Hargreaves, 2008). It can also refer to ascertaining that the desired goals of learning have been met or certifying that the required levels of competence have been achieved (Challis, 2005). In general, summative

assessment includes scoring for the purposes of awarding a grade or other forms of accreditation. Summative assessment has been the conventional form of assessment. It is commonly characterized by objective tests, pre-specified objectives and contents leading to uniformity of approaches, which mainly entail assessing general/broader content domains (Oosterhof et al., 2008). According to Oosterhof et al.'s analysis of online assessment literature, these characteristics allow summative assessment to be considered suitable for certifying learner's final achievements.

Summative assessment has been associated with undesirable learning approaches that may encourage surface learning and low order thinking because in most cases, it assesses declarative knowledge and basic application with no evidence of personal reflection and deep understanding (Smith, 2007; Tshibalo, 2007). These limitations have necessitated integration of formative assessment into teaching and learning in order to support learners to develop deep and robust knowledge. This is not to suggest that summative assessment has no potential to assess higher-order cognitive skills such as analysis, synthesis and evaluation. Instead, as Smith (2007) and Gijbels et al. (2005) identified, summative assessment depends on the nature of the underlying knowledge structures being assessed.

Formative assessment is commonly applied in the classroom as a source of ongoing feedback with the aim to improve teaching and learning (Hargreaves, 2008). It can also be referred to as assessment for learning that occurs during the course of instruction with the aim to support learning (Oosterhof et al., 2008; Vonderwell et al., 2007). Formative assessment activities are embedded within instructions to monitor learning and assess learners understanding for the purposes of modifying instruction and informing further learning through ongoing and timely feedback until the desired level of knowledge has been achieved. In their most recent and comprehensive review, Black and Wiliam (2009) attempted to provide a unifying basis for diverse practices of formative assessment. In describing formative assessment, Black and Wiliam noted that:

Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited. (p. 9)

Among the various definitions of formative assessment in the literature, the Black and Wiliam's (2009) definition aligns with this study view of formative assessment. However, their focus was general and did not specifically address online contexts. In this study this is expanded by using the term *instruction* to refer to both teaching and learning activities/processes intended to create learning opportunities. Black and Wiliam also articulate

the difference between intended use and actual results. This implies that formative assessment may fail to promote learning depending on how data obtained are used. As such, it is necessary to ensure that the evidence obtained is used in a way that fits formative purposes. This study definition also recognizes the shared responsibility and control to foster active learning by involving the teacher, individual learner, and peers as key actors in the learning process.

Formative assessment may also inform other stakeholders such as host institutions, parents, employers and the wider community about learner's progress (Smith, 2007). In this way, formative assessment serves summative purposes. On the other hand, summative assessment may also serve a formative role where data obtained are used to inform learning in subsequent units in the course. Smith noted that, "students and instructors may use exam results to adjust studying and teaching respectively, later in the course, so even exams can have a formative component; the line between formative and summative assessments is not sharp" (p. 30). This implies that any assessment could be formative or summative depending on how data obtained are used. However, from the perspective of this study it is important to note that teacher care is necessary when undertaking such actions to ensure that the formative role of the assessment is not compromised. In addition, the teacher needs to explicitly share with the learners how assessment data will be used.

As Oosterhof et al. (2008) suggested, it is important to recognize that these two forms of assessment have a core role in higher education. While formative assessment is considered instructionally paramount because it promotes learning, the role of summative assessment in higher education, which is concerned with accountability and certification, remains crucial. As such, summative assessments are essential in certifying learner's achievements and establishing what is typical and reasonable while formative assessment is needed within teaching and learning processes in order to support optimal learning.

Informed by these ideas, *formative assessment* is defined (in the context of this study) as the iterative processes of establishing what, how much and how well students are learning in relation to the learning goals and expected outcomes in order to inform tailored formative feedback and support further learning, a pedagogical strategy that is more productive when role is shared among the teacher, peers and the individual learner. The convergence of formative assessment with technological perspectives brings to life the concept of online formative assessment. In describing this convergence, Pachler et al. (2010) used the term *formative e-assessment* which they defined as "the use of ICT to support the iterative process of gathering and analyzing information about student learning by teachers as well as learners

and of evaluating it in relation to prior achievement and attainment of intended, as well as unintended learning outcomes” (p. 716). The Pachler et al.’s definition encompasses application of formative assessment in all forms of e-learning environments including the complementary role of ICT in face-to-face settings as well as in blended and online learning settings. In the same vein, this study conceptualizes *online formative assessment* as the application of formative assessment within learning online and blended settings where the teacher and learners are separated by time and/or space and where a substantial proportion of learning/teaching activities are conducted through web-based ICT. Therefore, this study specifically focuses on application of formative assessment in online and blended learning environments, thus use of the term online formative assessment.

2.5 Fundamental issues of assessment: validity, reliability and dishonesty

Similar to traditional face-to-face learning environments, fundamental issues of assessment in online settings need to be addressed in order to realize desirable outcomes (Oosterhof et al., 2008). These issues include validity, reliability and dishonesty. In online settings, these issues take on new dimensions in various ways due to the nature of interactivity in online environments among students and the teacher (Oosterhof et al., 2008; Wolsey, 2008). Wolsey (2008) illustrated the need for careful considerations during the design and embedding of formative assessment in online settings in order to address these issues effectively and overcome threats associated with them. Hargreaves (2007) also identified the need to recognize the distinction between validity and reliability within the context of assessment *for* learning (formative assessment) and assessment *of* learning (summative assessment). Although the study by Hargreaves (2007) did not specifically focus on online settings, it is important to note that the resulting ideas are relevant in both face-to-face and online contexts. In order to address the question sought to be answered in this study, it is necessary to reconceptualise and redefine validity and reliability within the context of formative assessment because the typical definitions applied in summative assessment are limited to quantitative conceptualizations, which is not sufficient to establish validity and reliability within the context of formative assessment. The nature of evidence in formative assessment encompasses multifaceted contexts (Blair & Monske, 2009; Rickards et al., 2008), and entails both processes and products of learning (Sorensen & Takle, 2005; Vonderwell et al., 2007), which calls for an alternative approach to issues of validity and reliability within the context of online formative assessment. Therefore, a qualitative or mixed methods approach is often required to establish the degree of validity and reliability in formative assessment. The

following sections identify characteristics of validity, reliability and dishonesty in formative assessment within the contexts of online learning in higher education.

2.5.1 Validity

It is important to start by reviewing the contemporary definition of validity as conceptualized in summative assessment. This will provide the basis to shift to a conception that aligns with formative assessment which is the central focus of this study. According to Messick (1989), validity is “an integrated evaluative judgment of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences and actions based on test scores” (p. 13). According to Messick’s (1989) conception of validity, one important principle of validity is the inferences we want to make from the test results; that is, the intended interpretation or the purpose of the test results. By implication, validation requires an explicit statement of the intended interpretations and uses (Shaw & Crisp, 2011). In describing validity as a concept that has evolved over time, Shaw and Crisp (2011) further noted that “contemporary validity theory generally sees validity as about the appropriateness of the inferences and uses made from assessment outcomes, including some considerations of the consequences of test score use” (p.14). Therefore, validity does not apply to the test (or assessment) itself but it focuses on the inferences made from the test results (or the assessment outcomes) and the decisions resulting from those inferences. Based on this viewpoint, assessment cannot be termed as valid or invalid. Instead, what is measured is the degree or extent of validity, for instance, in terms of the assessment being either more or less valid.

Within the unified conception of validity as articulated by Shaw and Crisp (2011), “validation activity requires sufficient evidence that the test actually measures what it claims to measure; the test scores demonstrate reliability; and that the test scores manifest associations with other variables in a way that is compatible with its predicted properties” (p. 18). Following this unified conception, reliability is fundamentally a component of validity in that validation emphasizes the need to consider multiple measures and multiple sources of evidence over a continued period of time when validating assessment inferences. However, these two concepts are presented separately in this review just for clarity purposes.

Drawing from this contemporary background, validity within the context of online formative assessment may be defined as the degree to which the assessment activities and processes promote further learning. This conception is based on the fundamental idea that the purpose of formative assessment is to support learning. In defining validity of formative

assessment, Hargreaves (2007) stated, “validity of an assessment for learning depends on how far the interpretation and use of the assessment actually leads to further learning” (p. 186). This implies that by just designing assessments intended to serve formative purposes does not make it more valid; instead, formative assessment must stimulate a high level of the desired learning. As noted earlier, Black and Wiliam (2009) reinforced this by articulating the difference between intended use and results in relation to realizing the purpose of assessment (formative or summative). As such, it is necessary to ensure that the evidence obtained is used in a way that fits the intended purpose of assessment thus enhancing validity of assessment. Consistent with this are ideas by various authors within blended and online settings. For instance, Feldman and Capobianco (2008) in illustrating that what may seem to be formative may turn out to be formatively less valid, as these authors noted: “... even when teachers ... use a series of assessments during the course of instruction, they tend to be short-term ways of obtaining summative information for the purposes of assigning grades rather than formative information for the improvement of teaching and learning” (p. 83). Similarly, use of online assessment techniques with the intention to promote learning does not necessarily make the assessment formatively more valid; instead, the key issue is whether these techniques are being used formatively (Pachler et al., 2010). To enhance the validity of online formative assessment, the teacher and the student need to appreciate that the learning it promotes is valuable. Teachers need to model and sustain effective formative assessment practices in order to achieve the potential benefits of online formative assessment.

Following analysis of the literature, this study identified that validity of online formative assessment relates to the following characteristics: (1) authenticity of assessment activities, (2) effective formative feedback, (3) multidimensional perspectives, and (4) learner support. These characteristics are discussed in the following paragraphs.

Firstly, validity of online formative assessments may be threatened if the assessment activities and processes are not authentic to encourage the envisioned outcome, that is, opportunities to apply knowledge, skills and judgements in diverse ill-structured contexts that characterize real world domains. This implies assessment activities should be authentic to the domain being studied. For instance, a study by Crisp and Ward (2008) demonstrated authentic contexts through realistic classroom situations, which provided teachers as learners with opportunities to develop and practice skills relevant in the teaching profession such as observation, analysis and decision-making, reflection, and personal professional development.

Other researchers (e.g. Lin, 2008; Mackey, 2009; Wang et al., 2008; Wiggins, 1993, 1997) have also identified the need to offer complex and authentic assessment activities that

engage the learner in decision-making and problem solving that is relevant to their real world situations. That way, learners engage themselves in meaningful ways that enable them to reflect deeply on both their learning processes and outcomes, which subsequently drive them towards metacognitive thinking and self learning. Metacognitive thinking is associated with enhanced ability to transfer knowledge to new situations (Crisp & Ward, 2008). According to Crisp and Ward, metacognition refers to “awareness of one’s own knowledge and being able to evaluate that knowledge [which] is important, because being able to identify the knowledge in which you are confident allows you to use your knowledge effectively” (p. 1511). This study agrees with the fact that online formative assessment needs to encourage and promote the student learning experiences through a variety of authentic tasks thus promoting engagement and transferability. As Herrington et al. (2006) demonstrated, the activities do not necessarily have to be in real world practice to be authentic; instead, authenticity may arise from engaging students with tools and/or tasks that are authentic to the domain being studied. This is particularly useful in facilitating contextual settings in order to enhance transferability.

The second characteristic emphasizes that for online formative assessment to be considered as adequately valid, feedback should be timely, ongoing, formatively useful and easy to understand (Gaytan & McEwen, 2007; Koh, 2008; Wang et al., 2008; Wolsey, 2008). Wolsey’s study examined importance of formative feedback and assessment in online settings. Findings from that study illustrated that formative feedback requires to be characterised by promptness and having a provision for the students to repeat and/or revise the unsatisfactorily submitted task. In describing the importance of prompt feedback, Wolsey noted that, “the most effective feedback is that which is given at the time the learning is constructed (or as close to it as practical). When feedback is not provided in a timely way or is not related to knowledge that is familiar to the students, they tend to ignore that feedback...” (p. 323). Similarly, Tallent-Runnels et al.’s (2006) review of online courses emphasized the immediacy of teacher’s feedback in asynchronous learning environments for sustained engagement. Online settings offer various tools that can enhance immediacy and clarity of feedback, which is important in promoting satisfaction and active participation.

In providing feedback, unfamiliar vocabulary or phrases need to be avoided in order to promote higher levels of thinking and understanding as well as motivating students to pay attention to feedback (Wolsey, 2008). According to Wolsey (2008), clear, timely, ongoing and adequately detailed feedback is important in online environments due to physical interaction barriers among online participants, which may discourage or limit some learners to seek clarity. Wolsey further illustrated that indirect feedback, such as offering references and

hints, as well as asking leading questions, facilitates student's development and achievement by encouraging the student to self-correct and to engage in reflective inquiry. These aspects manifest effective formative feedback that promotes student motivation towards self regulatory processes and confidence to demonstrate their capabilities (Nicol & Macfarlane, 2006). According to the findings of Van der Pol, Van den Berg, Admiraal, and Simons (2008), the nature of feedback in terms of content, style and presentation influences its use by students. This is to say, the more the students appreciate feedback (perceive it to be useful), the more they are likely to utilize the feedback in revising their work.

Effectiveness of feedback also relates to opportunities for frequent and meaningful interactions to enable shared purpose and meaning of learning goals and expected outcomes (Gaytan & McEwen, 2007; Wolsey, 2008). As Wolsey (2007) indicated, it is essential that the teacher share the rubrics with the learners, provide exemplars where applicable to achieve openness and transparency of rubrics, and support the feedback process. Wolsey further observed that online environments offer flexible opportunities to share and review rubrics thus promoting rubrics' openness and flexibility. Koh (2008) also identified that use of exemplars where applicable is crucial in making feedback easily understandable and clarifying rubrics and expected outcomes. Gaytan and McEwen (2007) in reporting the value and ways to foster opportunities for interaction and formative feedback noted:

Feedback is also a critical component in online assessment. It must be meaningful, timely, and should be supported by a well-designed rubric...The assessment value of e-mail messages, chat room conversations, and discussion board postings should not be ignored as they provide opportunities for the instructor to learn whether the students understand the instruction and are correctly interpreting the assessments. (p. 129)

Consistent with these findings of Gaytan and McEwen (2007) is a study by Van der Pol et al. (2008) which demonstrated that the level and quality of interactivity among online participants influence the effectiveness and efficiency of formative feedback.

The third characteristic that relates with validity of online formative assessment requires multidimensional approaches especially through incorporation of alternative activities. This approach can foster autonomy and flexibility thus enabling diverse opportunities for learners to demonstrate their capabilities and enhance their learning outcomes (Crisp & Ward, 2008; Gaytan & McEwen, 2007). In illustrating the need and means to enable multidimensional approaches, Gaytan and McEwen (2007) reported that, "effective online assessments should include a wide variety of clearly explained assignments on a regular basis" (p. 129). This in turn, may lead to mastery (deep) learning and equitable education through assessment activities that provide equal opportunity to learners with

diverse needs, skills and abilities, giving them diverse opportunities to demonstrate their capabilities and voice their needs. As demonstrated by Vonderwell et al. (2007) and Mackey (2009), providing flexible assessment tasks can support learner autonomy and motivate learners, for instance, by providing a variety of choices or open-ended tasks. This in turn, makes learners accept responsibility for their learning. Online settings enhance multidimensional perspectives by affording learners various technological resources that support them to utilize variety of approaches as they develop and demonstrate their competencies. However, it is necessary for the teacher to consider the nature of knowledge domain being assessed in order to determine the appropriate levels of flexibility to extend to the students. Practically, students' autonomy may be limited in cases where single or limited processes and/or approaches need to be closely followed. This may be associated with the aspects of authenticity within a particular domain, which may require that specific processes and/or tools are used and products meet specific standards.

Lastly, adequate learner support is critical to the validity within the context of formative assessment particularly in online settings. Sorensen and Takle (2005) demonstrated the usefulness of learner support in online settings. They showed that the teacher should be responsive to the diversity and needs of individual learners by supporting and mentoring learners as they learn and gain confidence on how to engage meaningfully in asynchronous environments. Tallent-Runnels et al. (2006) have also underscored the role of the teacher in mentoring and guiding learners in online learning. Mentoring as used in the current context refers to going beyond assisting learners to attain domain content knowledge and empowering learners (at least those experiencing learning difficulties) to develop positive dispositions as capable learners and encourage them to develop a habit of critical inquiry by persistently asking and/or answering questions correctly. This subsequently, enhances their personal and professional development, especially metacognitive skills, which is important in the field of higher education.

Other studies (Lin, 2008; Rickards et al., 2008; Wang, 2009) have demonstrated the value of learner support where both the teacher and peers are actors in facilitating or modelling this support. Findings by these studies indicate that students benefited from peer interactions, collaboration and feedback as they constructed their learning e-portfolios. According to findings of these studies, asynchronous collaboration among peers in online settings offered effective ways to support learners in their varying learning needs. For instance, Lin (2008) identifies the need to support students in technological needs while Rickards et al. (2008) recognized the need to model learner engagement with meaningful

reflection. Thus, there is need for the teacher to model and encourage collaboration and peer feedback among students within the learning processes.

2.5.2 Reliability

A study by Driessen, Vleuten, Schuwirth, Tartwijk, and Vermunt (2005), though not specific to online learning contexts, attempted to reconceptualize reliability within the context of formative assessment. Based on their ideas, reliability of online formative assessment is the degree to which what is assessed is dependable or sufficient to measure the level of knowledge structure being developed (the desired learning outcomes). Based on this conception, this study identified the following characteristics in relation to reliability within the context of online formative assessment: (1) opportunities for documenting and monitoring evidence of learning, (2) multiple sources of evidence of learning, and (3) explicit clarity of learning goals and shared meaning of rubrics. As it emerges through the ensuing paragraphs, characteristics of reliability tightly intertwine with validity aspects articulated in the previous sub-section.

Firstly, reliability within the context of online formative assessment relates to providing learners with an opportunity to demonstrate their progress and achievements by documenting evidence of their learning. Evidently, this would enable opportunities for monitoring the learning process and identify individual learners' progress, strengths and weaknesses in order to take remedial action until desired levels of knowledge are achieved (Chung et al., 2006; Gaytan & McEwen, 2007; Vonderwell et al., 2007). Therefore, online formative assessment should provide the teacher with opportunities to continuously monitor the learning that is taking place. Additionally, this can provide room for learners to monitor their own progress and achievements which in turn, motivates them to regulate their learning (Chung et al., 2006; Wang et al., 2008).

Secondly, reliability within online formative assessment relates to multidimensional approaches in order to provide opportunities for alternative approaches and solutions leading to multiple sources of evidence, thus enhancing reliability. As noted earlier, several studies in online formative assessment confirm the need and value of enabling multiple perspectives as evidence of learning. For instance, Gaytan and McEwen (2007) showed the need to incorporate a variety of assessment techniques and tasks to give learners multiple opportunities to demonstrate their learning. However, Smith (2007) observed that flexibility and autonomy require guiding the learners in choosing manageable tasks to avoid frustrations.

Thirdly, it is essential to realize that reliability within online formative assessment will be compromised unless rubrics are clearly defined, interpreted and shared. As Vonderwell et al. (2007) demonstrated, analytical rubrics allow students to assess their learning and guide them on expected level of performances. In the context of this study, while innovative approaches help to foster good work, rubrics help to define good work. According to Crisp and Ward (2008), and Vonderwell et al. (2007), opportunities to negotiate meaning and apply rubrics enhance learners' decision making skills and encourage them to become active participants in assessment. More importantly, this shared understanding and responsibility support the students to clearly understand the expected outcomes and become responsible for their learning. It also allows the teachers to reflect on their practice as well as on how to support students' development (Sorensen & Takle, 2005).

Instead of assigning scores based on overall perception of student's work, the scoring should be analytical to make it more reliable, that is, points assigned should be based on predetermined qualities clearly spelt out in the rubrics (Gaytan & McEwen, 2007). As illustrated in Smith (2007), scoring formative assessment activities can play an important role in ensuring consistency, fairness and motivation but it should not be used as the only source of evidence for assessing online formative assessment will depend on openness and transparency of rubrics. Reliability may be threatened if online formative assessment does not offer multiple opportunities for students to demonstrate their learning.

2.5.3 Dishonesty

The issue of dishonesty in online formative assessment is closely related to the issues of validity and reliability. This implies that within the context of online formative assessment, aspects of dishonesty can be addressed by enhancing validity and reliability. Various aspects of dishonesty are discussed in the ensuing paragraphs.

Dishonesty relates to verifying the real identity of the learner and work ownership by establishing whether the learner is the designated one, as well as ensuring that the student is using learning resources within stipulated boundaries (Khare & Lam, 2008). Oosterhof et al. (2008) suggested that this issue may not pose a great threat and it is less prevalent in online formative assessment. This is dependent on the teacher being explicit in sharing the purpose of assessment (Gaytan & McEwen, 2007). According to Oosterhof et al. (2008), when the purpose of assessment has been explained and expected performances have been clearly understood through analytical rubrics and exemplars, dishonesty is minimized. In analysing related literature, Kirkwood and Price (2008), and Gijbels, Segers, and Struyf (2008)

supported this by observing that learners' approaches to learning could be influenced by instructional strategies and assessments activities utilized by the teachers.

Teachers need to reflect on student needs and reconstruct their classroom practices to motivate a positive disposition towards learning and assessment in order to counter undesirable habits and discourage surface approaches to learning that are a threat to honesty (Oosterhof et al., 2008). This may involve fending off distorting and de-motivating effects of prior learning and assessment experiences. Various authors indicate that prior assessment experiences may influence learner perceptions of formative assessment either positively or negatively. For instance, Smith (2007) indicated that students pay more attention to formative assessment if they know they will gain a grade in return. Duers and Brown (2009) also demonstrated that some students indicated positive experiences from prior summative assessment acted as a motivator in formative assessment where they were motivated by competition. However, findings by Wolsey (2008) indicated that extrinsic motivators can lead to surface learning if they take precedence over deep learning. According to Gijbels et al. (2008), surface approaches to learning refer to where "students learn by memorizing and reproducing the factual contents of the study materials without seeking for further connections, meaning, or the implications of what is learned" (p. 432). Effective online formative assessment requires the teachers and student alike to reconsider what they value in assessment and how achievement of expected outcomes is demonstrated.

Oosterhof et al. (2008) observed that authentic formative assessment activities can greatly reduce the chances of dishonesty because learners are provided with scoring rubrics and model products alongside the assessment task to guide them in their work. Duers and Brown (2009) also demonstrated that the authentic nature of performance tasks greatly increases students' commitment thus minimising dishonesty. With authentic tasks, it is possible to assess the same concept while slightly varying the question or the problem thus defeating the usefulness of rote learning of answers among learners, and thus subsequently reducing the chances of cheating. Additionally, where the assessment activity is meaningful and holistic in elements of knowledge being assessed, cheating could be reduced.

Khare and Lam (2008) in reviewing the benefits and issues of online assessment associate the level of dishonesty with learners' academic level and suggest that postgraduate students exhibit low levels of dishonesty as compared to undergraduate counterparts. This can be explained by the fact that postgraduate students (at least in ideal situations) are mainly motivated by their commitment to master their subject of specialization and to apply it in meaningful contexts. In supporting this idea, Khare and Lam observed that adult learners

usually choose to further their education on their own initiative and they are likely to engage in deep learning approaches thus minimizing cheating. They further recommend that online assessment, whether formative or summative, is more appropriate for learners who are deemed to have dispositions of autonomy and self-regulation.

2.5.4 Summary of fundamental issues of assessment: validity, reliability and dishonesty

In summary, validity within the context of online assessment relates to ensuring a variety of meaningful assessment activities that foster contextual, inquiry-based learning and multidimensional perspectives. Validity also relates to effectiveness of formative feedback in relation to adequacy, immediacy, stimulating meaningful interactions, and offering adequate learner support. Reliability within the context of online formative assessment entails opportunities for ongoing documentation and monitoring learning, which informs the feedback process. Reliability also relates to enabling adequate opportunities for multiple sources of evidence of learning. Another way of enhancing reliability is through ensuring adequate opportunities to foster shared meaning of learning goals and assessment rubrics. The issue of dishonesty in online formative assessment, which relates to students truly owning their work, depends on the degree of inherent validity and reliability. This implies that dishonesty can be minimised through enhancing the identified aspects of validity and reliability.

A number of studies have demonstrated the need for embedded authentic assessment activities (Mackey, 2009; Mackey & Evans, 2011) and adequate learner support (Sorensen, 2005; Sorensen & Takle, 2005) in online learning to support learners' meaningful interaction and confidence to creatively explore new possibilities. The literature review presented here also identified that issues of validity and reliability, and dishonesty take new dimensions in online settings as compared to face-to-face settings. One such distinctive characteristic relates to the nature of interactivity in online as compared to face-to-face settings. Thus, careful considerations are necessary during the design and integration of formative assessment in online environments in order to facilitate desirable characteristics and overcome associated threats. For instance, Wolsey (2008) demonstrated how clear, timely, ongoing and adequately detailed feedback is crucial to meaningful communication due to physical interaction barriers among learners and the teacher. Another distinctive characteristic is that in online settings, feedback needs to go beyond details to being interactive in a way that stimulates further dialogue between the learner and the teacher or among the learners. In other words, feedback

should not be an end in itself; it should create further opportunities for shared meaning, ongoing learner support and scaffolding learning.

In addition, it is crucial to sustain immediacy of feedback in online settings as well as balancing this immediacy with reasonable amount of time for the students to respond. Vonderwell et al. (2007) exemplified this distinction in their study that utilized asynchronous threaded discussions to facilitate online learning and formative assessment. This balance is necessary for promoting deep inquiry, as learners need sufficient time to compose their thoughts and assess their understanding of content/issues before they respond or question other online participants. Furthermore, in online learning, individual learning styles and study plans are best taken into account.

Integrating online formative assessment while ensuring the identified characteristics will inevitably shift conceptions of validity and reliability and support functionality of online formative assessment as an innovative pedagogical strategy.

Having explored the fundamental issues, functionality of formative assessment in online environments was examined and is presented in the following section.

2.6 The functionality of online formative assessment

By addressing the fundamental issues discussed in the preceding section, online formative assessment can function as an innovative pedagogical strategy through facilitating the following opportunities: (1) formative and immediate feedback, (2) engagement with critical learning processes, and (3) promoting equitable education.

2.6.1 Formative and immediate feedback

Online environments can enhance opportunities for immediate and ongoing formative feedback. As Wolsey (2007) demonstrated in a study within an online context, formative feedback supports students to identify their strengths and weaknesses, revise their work, and continuously refine their understanding by reviewing feedback, which supports them towards engaged and self-regulated learning. It is evident that formative feedback can foster student engagement, improve achievement and enhance motivation to learn (Crisp & Ward, 2008). In reviewing the literature about formative assessment and its pedagogical implications in higher education, Koh (2008) identified deep learning, motivation and self-esteem, self-regulated and transferable learning as main benefits of formative feedback. Koh's review included studies in both online and face-to-face settings.

Effectiveness of feedback in relation to achieving interactive, adequate and timely formative feedback in online settings has a number of distinct characteristics as compared to face-to-face settings. Based on the findings of Sorensen and Takle (2005), and Vonderwell et al. (2007), embedding of formative assessment within online courses fostered a sense of an interactive and collaborative online learning communities, which provided learners with diverse opportunities for dynamic and meaningful interactions with other participants (particularly the teacher and peers). This in turn, enhanced opportunities for ongoing and interactive formative feedback. The Vonderwell et al.'s study was based on collaborative learning as a strategy for facilitating online learning, and its formative peer and self assessment. Their findings also indicated that online environments provided enhanced opportunities for students to respond or question the views of their peers, hence formative peer feedback. One way in which online environments enable such opportunities is through asynchronous threaded discussions, which allow students to have adequate time to compose and reflect on their thoughts about their understanding of content and/or views before sharing their thinking with other online participants (Kelly, Gale, Wheeler, & Tucker, 2007; Vonderwell et al., 2007). In illustrating this, Vonderwell et al. (2007) noted that:

Asynchronous discussions allowed students to rethink and assess their own understanding of content before they posted their responses... [this] facilitated reflective and self assessment processes...gave the students enough time to share a composed thought or question... and be able to reword messages before posting them online. Time for reflection and being able to revisit the discussion messages posted allowed the students to assess their own contribution. (p. 319)

Consistent with Vonderwell et al. (2007), a study by Van der Pol et al. (2008) within online environments associated effectiveness of formative feedback with opportunities for meaningful interactions. Their findings indicate that the level and quality of interactivity among online participants influence the effectiveness and efficiency of formative feedback. The viewpoint emanating from this study is that dynamic social relations between the student and the teacher are essential to provide effective feedback because it enhances motivation and satisfaction, which may encourage student's active engagement. Van der Pol et al. (2008) showed that online learning environments can allow more interactivity and can surpass interactions in face-to-face environments and provide enhanced opportunities for providing and reviewing peer feedback. Wolsey (2008) went further to illustrate how effectiveness of feedback can be enhanced in online settings through use of computer applications/software that offer opportunities to provide more detailed and clearly written feedback that is integrated within student work. These are critical aspects in online settings in relation to enhancing adequate and meaningful dialogue between the teacher and the learner. However, Wolsey

(2008) and Oosterhof et al. (2008) cautioned that, although integration of formative assessment in online environments can potentially offer enhanced interactivity, the design of these environments is critical because formative assessment requires additional design considerations from the outset in order to provide facilities that can foster its effective integration. Therefore, a better understanding of online formative assessment offers a means to enhance the design of online courses and expand opportunities for dynamic interactions and informal assessments. This is operationalized through systematic utilization of a variety of online tools such as online discussions, group interactions, emails and online chats to overcome limited opportunities for informal observations and questions in online contexts that are typically available in face-to-face environments, where teachers often assess understanding informally by interpreting students' body language and using oral questions to probe learners' understanding.

For online discussions to be formatively useful, the teacher needs to structure them in a way that they offer alternative forums/topics in order to enhance participation and foster learner autonomy (Vonderwell et al., 2007). Documentation of learning and assessment processes and products afforded in online settings also gives learners an opportunity to revisit their own and others' previous contributions as they compose responses and new ideas. These enable learners to progressively enhance their understanding of content and build knowledge collaboratively. It also fosters reflective dialogue, peer and self assessment among learners.

Chung et al. (2006) also illustrated how online formative feedback provided opportunities for scaffolding learning towards higher levels of achievement. Learners' achievements were assessed based on pre-defined learning goals, and feedback was offered by knowledgeable others in relation to the identified learning needs with the aim to enhance learner understanding. According to the Chung et al.'s findings, tailored feedback can promote the disposition of self-regulated learning and encourage the learners to reflect upon their work in the effort to develop further understanding. This is an important factor in higher education and particularly for 21st century learners, who need to develop the disposition of life-long self-improvement in order to meet their changing professional needs. Wolsey (2008) also demonstrated feedback as an essential feature of scaffolding learning by supporting learners to adjust their subsequent learning to close their performance gaps. Based on reviewed literature, this study is of the opinion that online and blended settings offer the teacher more ongoing opportunities to monitor and identify patterns of students' areas of weaknesses and provide feedback as concurrent scaffolded interventions (by being visible to all) that can meet the identified needs. Through ongoing monitoring of evidence of learning,

the teacher can observe and identify patterns in students' progress and achievements, interpret them, and make inferences about students' progress, which in turn informs the appropriate formative feedback to serve common needs. This could be of benefit in providing adequate formative feedback often constrained by time availability, which is pertinent in online settings. However, this should never replace the need for individualized feedback where necessary. Martens and Hermans (2000) in a study within online contexts demonstrated that identifying learner knowledge, skills and experiences can be beneficial to providing adequate feedback. This is because the online environment enables the teacher to allocate appropriate time for tailored feedback to individual learners based on identified needs. Thus, online settings can be designed so as to enhance opportunities for formative feedback and ongoing learner support. Such opportunities can facilitate learning processes that enhance learner engagement.

2.6.2 Engagement with critical learning processes

Another theme emerging from this literature review is that online formative assessment can engage learners in meaningful learning experiences through the creation of learning environments that support active engagement of learners. Engagement is instrumental to meaningful learning. According to Garrison and Akyol (2009) engaged learning provides the learners with opportunities to be active, creative and critical as well as being creators of their own perspective and identity, thus promoting their learning experiences. According to Herrington, Oliver, and Reeves (2003) authentic learning environments can influence learner engagement. They defined engagement as “what happens when we are able to give ourselves over to a representational action, comfortably and unambiguously” (Laurel, 1993, in Herrington et al. 2003, p. 5).

Oosterhof et al. (2008) noted that interaction and engagement are at opposite ends of a continuum in which interaction involves the exchange of ideas and information among participants. When such exchanges continue and participants become intrinsically motivated to deepen the interactions accompanied by in-depth thoughts and critical analysis, the learner moves up the continuum and becomes engaged with the learning process. Garrison and Akyol (2009) further supported this observation by suggesting that engaged learning occurs when learners move beyond simple interactions to purposeful and meaningful discourse essential to construct and validate meaning. Confirming this are findings by various researchers (e.g. Angus & Watson, 2009; Chung et al., 2006; Feldman & Capobianco, 2008; Lin, 2008; Wang et al., 2008) within blended learning environments which illustrated enhanced engagement

resulting from meaningful interactions with content, others and/or self afforded by online formative assessment.

Similarly, LeBaron and Bennett (2009) articulated how innovative instructional technologies can support self and peer assessment in online learning environments through three forms of interactions (learner and content/activities, learner and others, and learner and self). Through these interactions, online formative assessment not only enhances engagement but also provides opportunities for shared understanding of learning goals and expected outcomes. The following paragraphs present examination on how several studies exemplified these three forms of interactions in order to articulate how they relate to formative assessment within online settings and in which ways it enhances learner engagement.

Meaningful *interactions with content* occur when online formative assessment is within an authentic context that provides students opportunities with diverse challenging and engaging activities and materials and/or tools that are relevant to real life situations. Such contextual opportunities may entail a variety of authentic learning and assessment tasks/projects that require learners to use online tools that support collaborative inquiry, computer-based simulation tools (avatars), tools for finding and presenting knowledge, and/or rich databases for information and exemplar scenarios. Several authors (Correia & Davis, 2008; Crisp & Ward, 2008; Herrington et al., 2006; Lin, 2008; Mackey, 2009) have provided case studies of authentic contexts that motivated, and broadened the learner's autonomy and involvement leading to prolonged engagement and meaningful learning experiences that enhanced learner ability to transfer knowledge to new contexts. Crisp and Ward (2008) examined the role of online formative assessment in promoting deep learning and student motivation. Their findings demonstrated how scenario-based learning as a means of facilitating authentic learning context can enhance deep, collaborative, reflective and self-regulated learning. Herrington et al. (2006) examined how learner engagement could be enhanced through authentic learning environments to support meaningful interactions among learner, tasks and technological resources. They demonstrated that authentic tasks can promote deep understanding, enhance the learner's ability to transfer knowledge to real life contexts and motivate them to become life-long learners. Lin (2008) and Wang (2009) demonstrated how students' engagement with the process-oriented e-portfolios created an authentic learning context that supported collaborative learning and assessment. The processes included developing, documenting, sharing and reflecting on learning processes and products. The e-portfolio processes provided opportunities for collaboration to achieve shared understandings of expected performances, ongoing documentation and monitoring of learning

processes and products. In this way, they offered an authentic way of developing and assessing student knowledge. Subsequently, this enabled students to own and value their learning.

Mackey (2009), and Mackey and Evans (2011) also demonstrated how authentic contexts can be created by engaging learners with learning and assessment activities that require and motivate them to interact with varying contexts that blend online learning with their own professional settings. These studies focused on professional development for teachers in ICT-related skills and were framed within the theoretical perspective of COP (Wenger, 1998) as a way of enhancing transfer of learning into the student's practice. Through embedding authentic assessment activities within learning processes, Mackey (2009), and Mackey and Evans (2011) demonstrated a form of engagement that crossed online boundaries to provide learners with opportunities to blend online learning and work contexts within their professional COP in their workplaces (schools). As these studies demonstrated, this approach created an authentic learning environment that sustained engagement and autonomy of the learner beyond accomplishment of assessment requirements to self-learning and regulation, which, in turn, motivated them to integrate ICT in their professional practice. The findings of Mackey (2009), and Mackey and Evans (2011) also provided evidence that this form of engagement transformed learners' identities as leaders and knowledgeable others who influenced other members of their COP. These studies confirm that online formative assessment can foster learner engagement with critical learning processes that enable opportunities for active, contextualized, collaborative and reflective learning. As well, it provides room for dynamic interactions, and shared understanding of learning goals and expected outcomes. These, in turn, foster valuable learning experiences including active, contextual, collaborative, interactive, reflective, multiple perspectives orientation, and self-regulated aspects of learning. Hakkarainen, Saarelainen, and Ruokamo (2007) identified these experiences as instrumental to meaningful teaching and learning.

Mackey (2009), and Mackey and Evans (2011) also demonstrated that authentic online environments can provide teachers in a professional development programme with a variety of resources, particularly web 2.0 tools, to creatively try out and rediscovers new ways/possibilities on how these learners could integrate ICT in their own practice. The diverse and interactive nature of these online tools supported learners to build confidence, demonstrate their capability in various ways and share it with other members of the online and face-to-face communities. Through these opportunities, learners were motivated to identify their learning needs, strengths, to network and collaborate with like-minded others.

This supported progressive development of skills that were relevant and transferable to varying contexts, thus enhancing authenticity. Within these networks, learners also interacted with peers or colleagues who had varying views that challenged their thinking prompting them to reflect on alternative possibilities. In these ways, online formative assessment supported the growth of community online and enhanced learning also blended with the community of practice in the students' own school.

Chung et al. (2006) also adopted a problem-based learning approach within blended learning with an interactive online discussion as a strategy for online formative assessment that enhanced learners engagement both cognitively (through opportunities for feedback, ongoing monitoring and assessment, scaffolding learning, enhanced interactions) and affectively (other non-cognitive outcomes such as increased motivation and positive feelings).

Online formative assessment fosters *interaction with others* by providing opportunities for learners to interact meaningfully with other online participants, particularly their teacher and peers. This creates engaging learning environments, which enable learners to develop, share and compare understandings and experiences through asynchronous collaboration. These in turn, foster critical thinking, deep understanding and make the learning process self-scaffolding. Vonderwell et al. (2007) demonstrated how use of asynchronous online discussion as a strategy for self and peer formative assessment. This promotes reflective inquiry through enabling opportunities for dynamic and meaningful interactions, multiple perspectives, collaborative learning, shared understanding of learning goals and expected outcomes, and process-oriented and ongoing assessment. Vonderwell et al. also aimed to create learner and assessment centred learning through seamlessly integrating assessment into teaching and learning processes as well as enabling opportunities for shared responsibility where the teacher collaborates with the learners in negotiating meaning and applying rubrics.

Sorensen's (2005) study within an online context and framed within collaborative learning communities demonstrated engagement as a mutual process among all the online participants (teacher and learners). Sorensen focused on professional development for teachers in ICT-related skills. The study findings illustrated the need to go beyond individual involvement to incorporate mutual ability to develop and negotiate meaning with others within a social context. Consistent with Wolsey (2008) and Vonderwell et al. (2007) as noted earlier, Sorensen (2005) also demonstrated that online environments can provide dynamic opportunities for social interactions among learners and teachers as learners share their work, views and experiences. These forms of interactions provide opportunities for ongoing monitoring and assessment as learners engage in various learning and assessment activities. It

also provides expanded opportunities to identify learners' needs and provide ongoing support, hence formative assessment. According to Sorensen, mutual engagement within social contexts resonates with culture of real professional practices, thus enhancing learners' ability to develop skills that are relevant and transferable to their real world situations.

Sorensen and Takle (2005) designed and facilitated collaborative interactions and reflective online dialogue within threaded discussion forums where they and their meteorology students shared understanding of learning goals and content, self-reflections and ongoing assessment. They thus demonstrated a structure for learner and assessment centred design that was formatively evaluated by the educational technology students. For the two studied classes in that study, the online structure provided "an open process in which knowledge resources enter dynamically from outside via the *participants* [students] as well as through the teacher" (Sorensen & Takle, 2005, p. 54). Their structure illustrates how the teacher and learners are knowledge resources through shared roles of facilitating collaborative learning and ongoing assessment. It also offers a way to facilitate collaborative assessment of both processes and products of learning within the design of an online course. Through these processes, student participation, motivation and ownership of learning were enhanced. This in turn, fostered engaged learning and deep understandings in relation to desirable learning outcomes. While Sorensen and Takle (2005) illustrated ways of engaging learners with processes that reflect relevant professional practices in meteorology and educational technology, they did not go further to illuminate the nature of learning and assessment activities that could facilitate these processes.

Pachler et al. (2010) also illustrated how shared roles can enhance formative processes by demonstrating the convergence of theoretical perspectives and online formative assessment as a pedagogical practice. Their view of online formative assessment was framed within moments of contingency theoretical perspectives and conversational theoretical framework as articulated in Pachler et al. (2010). In illustrating that both the teacher and students are key players in enabling of effective online formative assessment, Pachler et al. noted:

Learner's response to a potential learning opportunity (provided for example, by teacher questioning, stimulus material, automated scoring of performance or peer comment) is part of their unique engagement in the learning process and is autobiographical. Responsiveness (on the part of the learner, teacher and/or peers) is key to contingency, and is necessary to 'moments', which have formative effects on learning (p. 716)... It is the learners and teachers as human actors who ultimately determine the formative effects of engaging with technologies, but technologies can shape the potential for this to happen. It is only when it is located in *wider* [shared] understandings of effective learning that the potentials of electronic tools to contribute to formative assessment can be understood and optimized. (p. 721)

As these authors demonstrated, through shared roles, authentic contexts were created to engage learners in collaborative and reflective discourse within an online learning community. Mackey (2009) also showed how blending students face-to-face professional work and online class contexts enabled opportunities for learners to engage with others during the learning process. Formative assessment by peers was evident in that learners engaged with peers who had varying or similar views (within online and real contexts) to reciprocate or question others' views that emerged during the learning process. These studies confirm that online formative assessment can provide learners with authentic, collaborative, and reflective learning environments to share learning experiences and dissonance of practice. These experiences emulate real professional communities of practice; thus, promoting learner ability to apply knowledge to their own practice.

Formative assessment enhances online environments by providing opportunities for *interaction with self*. This is afforded through expanded and flexible opportunities to document and annotate evidence of student growth and performance that allow ongoing monitoring of student progress and achievement by the teacher as well as the students themselves. As noted earlier, this is evident through the findings of various studies (Mackey, 2009; Mackey & Evans, 2011; Sorensen & Takle, 2005; Vonderwell et al., 2007). Their findings demonstrate that learners were engaged with self as they reflected on their thinking in the process of accomplishing the learning and assessment activities, hence self assessment. These in turn, allow students to reflect on, assess, own and value their work and enable the teacher to reflect on students' needs. In addition, Lin (2008) reported that engagement with formative-oriented e-portfolio processes enabled students to reflect and assess their own and peers' work, which facilitated subsequent learning and enabled them to improve their work.

Another way that can enhance interactions with self in online settings is through online self-assessment quizzes. Smith's (2007) case study found that students appreciated and benefited from immediate feedback from the self-test quizzes by enabling them to self-assess, reflect and revise their learning. The findings further revealed that students who frequently reviewed feedback performed better in summative assessment compared to those who did not or made limited reference to feedback. This implies that formative assessment may not benefit those students who do not fulfil their responsibility and sustain commitment. A limitation that Smith (2007) also acknowledges is that assessment of student learning was limited to quantitative measures and thus did not reveal all aspects of student learning. Consistent with Smith (2007) observations are the findings of Angus and Watson (2009) in a study with students at an Australian University in blended learning environments that showed how online

self-assessment quizzes provided students with immediate feedback which enabled them to improve their performance in summative assessment. Their study was not framed within a broader theoretical framework and was based on quantitative conceptualization in that the impact of formative assessment was measured only against students' improvements of grades in summative assessment. Dopper and Sjoer (2004) reported similar findings in their study with engineering students in blended environments. Their study utilized self-test quizzes as a strategy for self assessment and their findings revealed that this provided opportunities for self monitoring, revision and scaffolding learning. However, the study was limited to within one class. Based on these studies, it appears that self-assessment and reflections can enhance learner understanding of learning goals and expected outcomes, which, in turn, support students towards self-regulated learning.

It is apparent that through enhanced formative feedback and learner engagement, online formative assessment can serve other functions that are beneficial in higher education whether in online or face-to-face settings. As detailed in the next section, a key function is utilizing online formative assessment as a means to foster equitable education.

2.6.3 Promoting equitable education

Online formative assessment can foster equitable education by providing diverse learning opportunities to students with a variety of individual needs. In the view of this study, it facilitates responsive teaching and assessment that accommodate varying learning capabilities and styles, and supports progressive learning and development. This personalisation is likely to increase equity for those who are able to study online. As noted in Jenkins's (2005) review, effective online formative assessment focuses on what student know and are capable of achieving with tailored intervention guided by the learning goals rather than dwelling on the student weaknesses. Formative assessment places emphasis on empowering individual learners and promoting the worthwhile view that all learners are potential experts by providing learners with opportunities to demonstrate their expertise within a supportive learning community as they share their views, question and/or respond to others' views (teacher and peers) for purposes of shared understanding (Sorensen, 2005; Sorensen & Takle, 2005). Sorensen and Takle's (2005) findings concur with those of Vonderwell et al. (2007) in this subject. Both studies were based on a collaborative learning approach to facilitate online peer and self assessment. As noted earlier, Vonderwell et al. (2007) showed that online formative assessment can improve equitable education through diverse assessment activities that provide alternative means and multiple indicators for learners to demonstrate their

capabilities. Lin (2008) within blended settings, also demonstrated that collaborative learning and formative assessment supported students to assess their own progress and achievements, and make decisions about where they need to improve to close their performance gaps thus fostering equity in education.

2.6.4 Summary of the functionality of online formative assessment

It is increasingly evident that through online formative assessment, a learner and assessment-centred focus can be created where learners are actively engaged in the learning process. Online settings provide a dynamic environment where teacher and learners can collaborate to achieve shared meaning of learning goals, content and expected outcomes, and monitor progress towards their achievement. Through opportunities for ongoing monitoring, learner strengths and weaknesses can be identified and formative feedback provided by both the teacher and peers to support individual learners to close their performance gaps. Formative feedback supports learners to interact meaningfully with learning activities/resources, knowledgeable others (teacher and peers) and self. These forms of interactions overlap to facilitate critical learning experiences such as active inquiry, contextual, collaborative, reflective and self-regulated aspects of meaningful learning. By implication, such opportunities for responsive instructions can cater for diverse learning needs thus fostering equitable education.

As previously noted, a number of authors (e.g. Van der Pol et al., 2008; Wolsey, 2008) have demonstrated that online settings can offer interactivity that may surpass interactions in face-to-face environments particularly in relation to opportunities for providing and reviewing feedback. They offer more opportunities for teacher and learners to share the role of providing feedback on peers' work. These in turn, enhance the level and quality of interactivity among online participants and positively influence the effectiveness and efficiency of formative feedback. Effective use of feedback supports individual learners to close performance gaps. Wolsey (2008) went further to illustrate that online settings can offer enhanced opportunities to provide more detailed and clearly written feedback that is integrated within student work. These are critical aspects in online settings in relation to enhancing meaningful dialogue between the teacher and the learner. However, as Wolsey (2008) cautioned, in order to realize these benefits, the design of an online course is critical and requires careful design considerations from the outset in order to facilitate opportunities for effective formative assessment.

Other authors (Mackey, 2009; Sorensen & Takle, 2005; Vonderwell et al., 2007) demonstrated that meaningful learning and formative assessment activities can engage learners in collaborative, interactive and reflective discourse within a learning community that resonates with professional practices. This is likely to foster transferable learning and support learners to develop self-regulated learning strategies, which is an important disposition in online settings. It also appears that online formative assessment can contribute to improved performance in summative assessment if learners constantly review feedback to further their understanding. Inevitably, convergence of formative assessment and online affordances provide scalability and great flexibility when learning resources, processes and products are shared concurrently among online participants.

The benefits of online formative assessment discussed here are facilitated through a variety of approaches that emerge from the reviewed literature including self, peer and e-portfolio assessment. Each of these techniques utilizes a variety of online tools such as asynchronous discussion forums, self-test quiz tools, and e-portfolios. It is important to note that these techniques overlap and can be intertwined and applied synergistically. Online formative assessment through these techniques can facilitate a multidimensional perspective to assessment for learning. The effectiveness of these techniques depends on innovative and appropriate utilization in order to make online formative assessment an effective pedagogical strategy. While online formative assessment has the potential to afford these opportunities, it appears that it cannot produce desired effect without addressing issues associated with assessment. Indeed, as articulated in the previous section, it appears that there is need to reconceptualise fundamental issues of assessment within the context of online formative assessment. The following section presents an analysis of the findings.

2.7 Discussion

Findings from the analysis of the literature suggest that online formative assessment can provide a means to align assessment with teaching and learning, and inevitably change how learning and assessment occur. In the context of this study, such pedagogical enactments can potentially shrink the gap between learning to know and do, and assessing learning to meet formative and summative assessment purposes. It also follows that this would blur the gap between formative and summative assessment, and assist in achieving the desirable harmony among curriculum, pedagogy and assessment. Embedded assessment is centred within the concept of ongoing monitoring of learning and formative feedback, hence formative assessment. The findings of several studies (e.g. Crisp & Ward, 2008; Gijbels et al., 2005;

Sorensen & Takle, 2005; Van der Pol et al., 2008; Vonderwell et al., 2007; Wang et al., 2008) indicate that effective use of online formative assessment can engage students and teachers in meaningful educational experiences as it provides them with opportunities to collaboratively identify the learning needs and devising strategies of how to meet those needs. This is through offering expanded opportunities to document, monitor and assess students' progress and achievements, which informs the desired formative feedback. In these ways, online formative assessment can play a crucial role in enhancing learning by creating improved learning environments that motivate students to actively engage and regulate their studies (Chung et al., 2006; Koh, 2008; Pachler et al., 2010; Wang et al., 2008).

Formative assessment makes extensive use of formative feedback, therefore from the point of view of this study it is notable that the findings of this systematic literature review of online formative assessment align with Hattie and Timperly's (2007) meta-analysis and model. Within the summary of effect sizes calculated as a second order meta-analysis, they identified an effect size of 0.52 for, not online instruction, but computer-assisted instructional feedback, in general (drawn from four meta analyses). They also note:

A more detailed synthesis of 74 meta-analyses in Hattie's (1999) database that included some information about feedback (across more than 7,000 studies and 13,370 effect sizes) demonstrated that the most effective forms of feedback provide cues or reinforcement to learners; are in the form of video-, audio-, or computer-assisted instructional feedback; and/or relate to goals. Programmed instruction, praise, punishment, and extrinsic rewards were the least effective for enhancing achievement. Indeed, it is doubtful whether rewards should be thought of as feedback at all. (p. 82)

Although Hattie and Timperly (2007) did not refer to online learning at all and much of their research was drawn from studies of K-12 education, the model they produced can be useful to discuss the evidence found in this systematic literature review. A paragraph in their conclusion provides a useful summary for what qualifies as quality formative feedback in the context of this study:

The model discriminates between four levels of feedback: the task, the processing, the regulatory, and the self levels. Effective feedback at the task, process, and self-regulatory levels is interrelated. FT [feedback at the task] is more powerful when it results from faulty interpretations, not a lack of understanding. It is most effective when it aids in building cues and information regarding erroneous hypothesis and ideas and then leads to the development of more effective and efficient strategies for processing and understanding the material. Feedback at the process level is most beneficial when it helps students reject erroneous hypotheses and provides cues to directions for searching and strategizing. Such cues sensitize students to the competence or strategy information in a task or situation. Ideally, it moves from the task to the processes or understandings necessary to learn the task to regulation about continuing beyond the task to more challenging tasks and goals. This process results in higher confidence and greater investment of effort. This flow typically occurs as students gain greater fluency and mastery. Feedback that attends to self regulation is powerful to the degree that it leads to further engagement with or investing further effort into the task, to enhanced self-

efficacy, and to attributions that the feedback is deserved and earned. When feedback draws attention to the regulatory processes needed to engage with a task, learners' beliefs about the importance of effort and their conceptions of learning can be important moderators in the learning process. (p. 102)

Noteworthy in this quote from Hattie and Timperly (2007), is that effective formative feedback focuses on both products and processes of learning and assessment, and facilitates self-regulatory processes among the students. Self-regulated learning refers to "an active constructive process whereby learners set goals for their learning and monitor, regulate and control their cognition, motivation, and behaviour, guided by their goals and the contextual features of the environment" (Pintrich & Zusho, 2002, in Nicol & Macfarlane, 2006, p. 202). Self-regulation creates a learner and assessment centred focus where the teacher becomes a facilitator as opposed to an expert, and learners assume a more active role. This can foster shared purpose and responsibilities among learners and the teacher in ongoing monitoring, assessment and provision of feedback to their peers. These are critical requirements particularly in online learning environments where learners are expected to assume primary responsibility for their learning. Nicol and Macfarlane (2006) through their synthesis of research literature within the context of higher education developed a model of effective formative feedback underpinned within the concept of self-regulated learning. Within their model, they explicitly identified seven characteristics (principles) of effective formative feedback.

This study affirms that the seven principles of Nicol and Macfarlane's (2006) feedback model are an essential condition for effective formative feedback (as the most critical element within online formative assessment processes) that sustainably support adequate scaffolding and the development of self-regulation dispositions among online learners. As identified by Nicol and Macfarlane (2006, p. 205), effective formative feedback:

1. helps clarify what good performance is (goals, criteria, expected standards),
2. facilitates the development of self-assessment (reflection) in learning,
3. delivers high quality information to students about their learning,
4. encourages teacher and peer dialogue around learning,
5. encourages positive motivational beliefs and self-esteem,
6. provides opportunities to close the gap between current and desired performance and,
7. provides information to teachers that can be used to help shape teaching. (p. 205),

Effective formative assessment also entails embedding a variety of ongoing and authentic assessment activities within online teaching and learning processes to facilitate active cognitive engagement and offer enhanced opportunities for ongoing assessment of

learning and provision of ongoing formative feedback. As identified through this literature review findings, engagement with ongoing and authentic assessment activities requires and/or stimulates learners to interact with others, particularly the teacher and peers. In order to successfully accomplish the assessment activities, learners are stimulated to engage meaningfully with others as they asynchronously share and validate their understanding of content and the expected outcomes. Moreover, authenticity inherent within the formative assessment activities can require learners to interact with others within and/or beyond the online classroom. Through the assessment activities being ongoing and authentic to facilitate meaningful interactions, it also implies that these interactions become dynamic and ongoing thus facilitating development of an interactive online learning community that reciprocally supports individual learners to enhance their understanding of content and improve their achievement of the expected learning outcomes through ongoing and interactive formative feedback. Moreover, a variety of ongoing assessment activities offers multiple sources of evidence of learning and ultimately provides learners with diverse opportunities to demonstrate their capabilities and illuminate their learning needs. For instance, learners may be required and/or stimulated to engage with others within collaborative online discourse as exemplified by Sorensen and Takle (2005) and Vonderwell et al. (2007). In these studies, authenticity was facilitated through collaborative interactions and reflective online dialogue using asynchronous discussion forums as a tool for supporting ongoing formative assessment by self, peers and teacher. Based on the findings of these studies, framing formative assessment processes within threaded asynchronous discussions provided a unique opportunity to enhance the online discourse and achieve meaningful engagement in two ways by firstly facilitating opportunities for internal feedback (reflection or interaction with self) through providing the students with ample opportunities to review the feedback they receive (responses from others) and revisit related previous exchanges and secondly by providing learners with adequate opportunities to review and reflect upon previous contributions (by self or others), which assist them to reconstruct their thinking and compose deeply-thought ideas which they posted online as their new contributions and/or responses (feedback) to others' ideas. Moreover, as demonstrated by Mackey (2009), authentic formative assessment activities motivated learners to interact with varying contexts (online and f2f), and with others (within and beyond online contexts) as they accomplished activities that required them to interact with real-life professional contexts. Lin (2008) and Wang (2009) demonstrated how students' engagement with process-oriented e-portfolios created an authentic learning context that supported collaborative learning and assessment. These process oriented e-portfolios

were framed within collaborative learning approaches which entailed individual students developing and progressively documenting their artefacts while at the same time sharing with the teacher and peers (by being public to others), as well as reflecting on their learning processes and products. Within these formative assessment processes, individual learner also have opportunities to share their developing thinking and progress in relation to accomplishing the assessment activities which elicits the necessary learning support, which they receive as formative feedback from the teacher and peers. Through such valuable learning experiences, online formative assessment supports engaged and deep learning.

In order to facilitate such effectiveness for formative assessment within online contexts as discussed here, the teacher has to ensure there are opportunities for ongoing documentation of learners' progress and achievement as evidence of learning and sharing of this evidence by making it visible (public) to all participants. To achieve effective collaboration within these formative processes, it is necessary to foster shared responsibility among all the course participants (the individual, peers and the teacher) as an online learning community with shared goals. In the same vein, explicit clarity of learning goals and shared meaning of expected outcomes (rubrics) are required from the outset. In these ways, online formative assessment can offer a systematic strategy for facilitating meaningful interactions and development of a collaborative online learning community and in turn enhance opportunities for adequate learner support and scaffolding learning through ongoing monitoring and provision of formative feedback. This can ultimately support meaningful engagement and higher-order learning. Through these elements, effective online formative assessment will inevitably help in addressing important issues within online learning contexts in relation to achieving and sustaining meaningful interactions and adequate scaffolding in order to address the challenges of learners' frustrations due to the physical interaction barriers (as compared to face-to-face settings), and lack of the required self-regulated learning dispositions. Ludwig-Hardman and Dunclap's (2003) study have explicitly identified these challenges as critical in online learning.

As it has emerged through the findings of this review, online formative assessment is facilitated through various techniques or strategies such as self and peer formative assessment, as well as teacher engagement with formative assessment. Findings of this review suggest that these techniques are operationalized through systematic utilization of a variety of online tools such as asynchronous discussion tools, self-test quiz tools either as stand-alone web-based tools or as features within the LMS. Web-based e-portfolios have also been used as a tool for online formative assessment. Framing use of such online tools within the concept

of formative assessment will offer a systematic strategy for enhancing opportunities meaningful interactions within supportive learning communities and inevitably create more opportunities for interactions and ongoing learning support in online settings that are typically limited as compared to face-to-face settings. In face-to-face settings learners have more opportunities to interact with peers and the teacher as well, thus creating more opportunities for the teacher to informally assess learners' understandings.

This notwithstanding, these enactments which are core to online pedagogy will essentially depend on teachers' beliefs. Leading scholars (Gipps, 1999; Shepard, 2000) in assessment of formal learning have long argued that teacher beliefs greatly influence their conceptions about what is valued as learning, and by implication, how learning is assessed. In their review of research, Larreanendy-Joerns and Leinhardt (2006) reinforced these ideas within the context of online learning and observed that online courses require:

Professors to render explicit account of pedagogical moves and assumptions that pass unnoticed in day-to-day teaching practice but are worth re-enacting in online environments. These pedagogical elements include, among other things, the faculty members' conception of the discipline and the learner; the varieties of student-teacher interactions that they believe are conducive to learning, their use of disciplinary and pedagogical representations, and their take on student assessment. (p. 597)

This implies that, effective application of formative assessment requires most educators to reconsider what is valued and commit to use assessment in diverse ways to effectively gather information about students' understanding and enable them to continually reflect on their own needs as well as those of their students. This is part of self regulation processes referred to by Hattie and Timperly (2007), albeit more appropriate in higher education contexts. Given the need to reconsider and develop more mature pedagogical strategies, it becomes less surprising that the reviewed empirical studies drew extensively on teacher education and many at the graduate level.

A study by Niles (2007) contrasted the espoused beliefs and practice of two engineering educators teaching online, only one of whom had been prepared professionally to teach. There was a large gap between espoused beliefs and practices of the less prepared teacher and this suggests that many faculty in higher education may need extensive professional development and support to make effective use of formative assessment in online and blended learning in higher education.

2.8 Conclusions

The literature reviewed in this chapter provides evidence that online formative assessment has the potential to engage both teachers and learners in productive educational experiences.

Previous research suggests that online formative assessment may offer a pedagogical strategy that can shift the assessment culture in ways that support diverse learning needs and foster equitable education. In particular, formative assessment offers online learners opportunities for enhanced interactivity and ongoing formative feedback. This in turn, engage them with valuable learning experiences including active, contextual, interactive, collaborative, multidimensional, reflective and self-regulated aspects of meaningful learning. In these ways, online formative assessment can support higher education to meet the needs of the 21st century professional learners.

In order to realize this potential, various aspects of validity and reliability that emerged as pertinent have been raised and discussed through this chapter. Of particular importance among these aspects is ensuring: a variety of ongoing and authentic assessment activities; appropriate learner autonomy; effective formative feedback; and teacher's role in fostering shared purpose and understanding of learning goals, content and expected outcomes. Authentic assessment activities and appropriate learner autonomy coupled with adequate teacher's guidance play an important role in sustaining multifaceted interactivity with content, tools, others (within and beyond the online classroom) and interaction with self (reflectivity). These in turn, can foster meaningful engagement and development of self-regulatory dispositions.

Based on the reviewed literature, it is clearly evident that formative assessment is a valuable pedagogical strategy that needs further research and more widespread implementation. The findings of this review reveals the necessity to seek further understandings on how best to apply formative assessment in online settings, and this affirms the need for the current study with a focus on exploring the design and implementation of formative assessment within online courses for CPD; and establishing its impact on students' learning experiences. Framing this study within a relevant theoretical framework was useful in achieving more useful findings, especially with respect to the context of the current research. Such a systematic approach enabled the researcher to elucidate an effective pedagogical design that addressed the issues of validity and reliability of formative assessment, identified as problematic in this review. The following section describes the theoretical perspectives adopted in this study.

2.9 Theoretical underpinnings

This section describes the theoretical perspectives adopted in this study and their underlying philosophical foundation. Designed as a multi-case study research, there was need to identify

and adopt a theoretical framework that was congruent with the study focus. As noted earlier, a congruent theoretical framework was also important in realizing a systematic research design. Yin (2009) noted the importance of adopting a relevant theoretical framework in case study research particularly to guide the data collection and analysis processes.

During the last two decades, various theoretical perspectives for learning have emerged with respect to the view of teaching and learning that is relevant to the emerging needs of the knowledge society in which ICT are prevalent. In examining the role of theory in aligning pedagogy with ICT in the context of distance education, Tam (2000) identified a number of fitting perspectives that mirror the underlying principles of socio-constructivist theories, in particular, situated cognition (Brown, Collins, & Duguid, 1989) and related theoretical frameworks such as situated and authentic learning (Lave & Wenger, 1991) and the Vygotsky's developmental psychology theory. Following these theoretical perspectives, Tam (2000) conceptualized learning as both individual and collective, and is centred within the following defining principles:

- Learning is a process of knowledge construction; knowledge is actively constructed rather than passively acquired and individuals construct subjective meaning of their own experiences
- Learning encompass both processes and products of learning
- Teaching does not necessarily translate into learning
- Knowledge construction is fostered by active involvement, contextual, collaborative and reflective learning experiences
- Assessment is fundamental to teaching and learning.

Within the higher education arena, situated cognition theoretical perspectives are valuable because they encourage and support deep learning approaches. As Tam (2000) argued, such perspectives have the potential to address the challenges of higher education particularly the need to provide authentic learning environments that reflect real-world contexts. This in turn can support learners to develop robust and transferable knowledge necessary for addressing the professional development needs in the knowledge society that is characterized by constantly changing situations.

Situated learning is rooted in situated cognition theory which emphasize that knowledge construction extends beyond individual to include social interactions and the learning environment (Brown et al., 1989). A core perspective within situated cognition and learning is authentic learning. Brown et al. (1989) defined authentic activities as “the ordinary

practices of the culture” (p. 34). This implies that learning occurs through active participation in activities that reflect real-world practices and contexts within a social context. Similarly, this also suggests that knowledge is situated within dynamic interactions among the individual, authentic activity, community and tools of culture. As Brown et al. (1989) argued, it is important to frame learning within its contextual application in order to promote achievement of useable and robust knowledge. Consistent with Brown et al. (1989), Lave and Wenger (1991) delineates situated learning as the shift “from the notion of an individual learner to the concept of legitimate peripheral participation in communities of practice [COP]” (p. 94). Kirschner and Lai (2007) also underscore the duality of individual and group learning. This conceptualization is framed within the Wenger’s (1998) theoretical perspectives of COP which they defined as:

...places where a process of social learning occurs between people with a common interest in a subject or problem who collaborate over longer periods of time to share and exchange ideas, find solutions and build knowledge. The heart of learning in a (community of practice) is discourse and dialog to build personal, individual understanding and shared, group understanding. (Kirschner and Lai, 2007, p.128)

Lai et al. (2006) also suggest that “communities of practice are learning communities whereas some other [*online*] groups, for example, interest groups, are not...In a learning community, members are constantly learning new skills and working to discover and propagate knowledge” (p.13). The concept of learning within a social context also subscribes to Vygotsky’s (1978) theory of zone of proximal development (ZPD) that is underpinned by the concept of scaffolding learning through interactions with others (particularly the teacher and peers).

Situated and authentic learning perspectives seeks to challenge the notion that learning can simply occur through observing and imitating others as opposed to co-participation within real-life practices as a way to promote learning. Lave and Wenger (1991), and Wenger (1998) view learning as a socially mediated process where meaningful learning occurs through dynamic interactions and shared understanding with others as individual learners engage in an authentic activity within COP. Lai et al. (2006) also emphasize that teachers’ professional development is an ongoing process that is promoted by learning within a community; and “community building requires members to engage in meaningful activities that produce shareable artefacts” (p. 36). Helleve (2010) reinforces this in suggesting the need to provide teachers as professional learners with sustained opportunities to apply and share their prior knowledge and experiences, that is,

...a situated perspective accounts for teachers’ learning based on their own experiences, tacit knowledge, and knowledge-in-practice...teachers’ professional development is part of a

systematic ongoing learning process for the individual teacher as well as the community in order to articulate tacit knowledge. (Helleve, 2010, p. 3)

These perspectives imply that meaningful learning is facilitated through authentic activities that engage learners both individually and collectively within a social and real-life context. Moreover, Lave and Wenger (1991) advocated for learner-centred focus as an essential feature for situated learning in which teachers or educators are viewed as co-participants and facilitators as opposed to experts. Their views on ‘situatedness’ also suggest that meaningful learning occurs when learners are engaged actively in performing authentic activities that reflect real-world practices within a learning community in which both teacher and peers are perceived as key learning resources. Lave and Wenger (1991) further argued that learning resources and opportunities are shaped by learning experiences within a social context as opposed to prescribed structures.

Situated learning is one perspective that has been identified to be particularly relevant in 21st century distance higher education; and harmonious with pedagogical affordances of Web-based learning environments (Herrington, Reeves, Oliver, & Woo, 2004). According to Herrington et al. (2004), situated learning is defined as the notion of learning in authentic contexts that reflect how knowledge will be used in real-life situations. They illustrated that situated learning has the potential to support learners to develop deep understanding and enhance their ability to transfer knowledge in real-life situations. Naidu (2007) also suggested that creating situated learning environment that engage learners in authentic activities is key to promoting learning experiences in online learning. Authentic activities refers to “tasks that have real-world relevance and utility, that integrate across the curriculum, that provide appropriate level of complexity, and that allow students to select appropriate level of difficulty or involvement” (Herrington et al., 2003, p. 61). In reviewing empirical literature in authentic online learning, Herrington et al. also suggested that engaging learners with authentic activities facilitates an authentic learning environment “that provide a great deal of meaning to otherwise decontextualized facts and skills, and can enhance the transfer of deep and life-long learning” (2003, p. 62). Herrington et al. (2006) went further to indicate that online learning environments need to provide authentic contexts and activities that are meaningful and relevant in real-world in order to motivate and support deep learning. This implies that teachers do not design learning; instead, they facilitate (or design for) authentic learning environments that influence students’ learning experiences (processes) and outcomes (Naidu, 2009).

It is now apparent that online learning environments require educators to offer authentic learning activities that are complex and open-ended to stimulate active learners' engagement in higher-order thinking over a sustained period of time. Herrington et al. (2006) identified that authentic learning activities can promote valuable learning experiences by increasing learners' engagement with critical learning experiences associated with authentic learning. These include active, contextual, interactive, collaborative, reflective, multidimensional perspectives, and self-regulated aspects of learning. These experiences have been identified as defining characteristics of meaningful learning by various authors (Hakkarainen et al., 2007; Herrington et al., 2006). As Herrington et al. (2006) identified, enhanced engagement can lead to meaningful learning outcomes such as deep understanding, enhance learner's ability to transfer knowledge to new contexts. Dabbagh et al. (2005, pp. 34-48) suggested that these experiences are very relevant in online learning where the challenge has been how to support and encourage learners to become more active and responsible for their learning. Interactive, collaborative and reflective learning experiences have particularly been identified by various authors as critical in professional learning in general (Mezirow, 2000, 2003), and in teachers' professional development in particular (Darling-Hammond & Richardson, 2009; Kabes & Engstrom, 2010; Nesbit, 2001). Signer's (2008) model of online professional development for teachers also emphasizes interactive collaborations and reflective learning as fundamental experiences in supporting self-regulation, and development of transferable and life-long learning skills in ICT education for continuing teachers. These abilities are particularly relevant for teachers in the 21st century in which application of knowledge and skills in real-life contexts has become more complex (Helleve, 2010). It is apparent that teachers as professional learners need to learn in authentic learning environments that reflect how knowledge will be useful in their real professional contexts. This is particularly crucial in relation to enabling them to transfer ICT knowledge and skills in their own pedagogical practices (Mackey, 2011).

Despite the opportunities that come with authentic learning environments, various limitations have been associated with authentic learning and by implication its assessment. These limitations are particularly related to the models of authenticity that assume authentic or contextualized learning can be achieved by simply offering tasks that are similar to those of real-world practices without considerations of what this may mean to the learners; and therefore resulting to standard apprenticeship as opposed to cognitive realism (Barab, Squire, & Dueber, 2000; Herrington, 2006). As illustrated by Barab et al. (2000), cognitive realism implies that learning contexts and activities need to go beyond the task itself to being

persuasive in order for the learner to perceive them as real, and thus authentic. Cognitive realism is vital to learning for transfer because it emphasizes on cognitive skills and perceptions. This can be achieved by supporting learners to perceive the learning activities as meaningful and connect it with real-life applications without necessitating excessive contextualization that can limit transfer of knowledge to varying contexts (Martens, et al., 2007). Barab et al.'s (2000) findings suggest that a focus on emergent authenticity, expertise and ownership among learners and teachers is a key means of overcoming these limitations. This implies that authenticity in deed emerges through negotiated meaning among all the participants as they engage in authentic learning and assessment activities. Central to Barab et al.'s perspectives is that productive "authenticity emerges through meaningful relations among individual, community and task...[in which negotiated meanings] emerge through shared discourses and practices all within the constraints imposed by the tasks at hand in relation to their function to all parties" (Barab et al., 2000, p. 42). Following Barab et al.'s viewpoints, authentic learning environment is created through interactions among the three defining components (individual learner, community, and authentic (learning and assessment) activity), and thus cannot be realized in absence of one of these components.

As Herrington et al. (2006) noted, it is important to realize that an activity does not necessarily have to be real-world physically for it to be authentic; instead, authenticity may arise from engaging students with tools and/or materials that are authentic to the domain being studied. As indicated by Herrington et al. (2006), precaution should also be taken to ensure appropriate levels of contextualization through provision of multiple contextual settings and abstract representation in order to achieve cognitive realism and to avoid counteracting transferability. As such, it is the responsibility of educators to professionally evaluate what may be appropriate and relevant in their particular instructional situation in relation to enabling desirable contextualization. Herrington et al. (2006) went further to emphasize that what is critical in promoting emergent authenticity is dynamic and sustained interactions among the learner, activity within an authentic learning environment. This is not to suggest that 'real' participation in COP and simulation models of authenticity as articulated by some proponents of situated learning (e.g. Lave & Wenger, 1991) are not valuable in supporting deep and transferable learning. Instead, it is to emphasize that it is vital for educators to underpin the design of authentic learning contexts and activities on shared meaning necessary to promote emergent authenticity; which is influenced by learner perceptions about the value and meaning of the learning activity in their own real world. According to Barab et al. (2000), "authenticity lies in the learner-perceived relations between

practices they are carrying out and the use value of these practices...authenticity is an emergent process that occurs as individuals engage in practices of value to themselves and to the community of practice[COP]" (p. 38). As such, authenticity is not restricted to learning within real-world physical locations and practices. Therefore, what is crucial is the integration of authentic learning and assessment activities that elicit the essential characteristics of authenticity within the design of an online course (Herrington et al., 2006; Martens et al., 2007).

At the core of facilitating authentic learning environments is emphasis on embedding authentic assessment activities within teaching and learning processes in order to promote meaningful learning and ongoing assessment. Herrington et al. exemplified some design principles for authentic online learning in which they emphasized integration of authentic assessment activities (see Herrington et al., 2006). Whilst there may be other pedagogical strategies to operationalize embedded assessment for purposes of promoting learning, effective integration of formative assessment within online learning was identified as a viable means to serve this purpose. The concept of embedding assessment within teaching and learning processes tightly overlap with the concept of formative assessment in that both place emphasis on authentic assessment activities that are an integral part of teaching and learning processes for purposes of supporting learners to develop desirable competencies. According to Correia (2008), it is important to provide ongoing authentic assessment activities that are meaningful in real-life contexts in order to support robust understandings and enhance ability to transfer knowledge. Based on the findings of the reviewed literature (e.g. Mackey, 2009; Sorensen & Takle, 2005; Vonderwell et al., 2007) as presented earlier in this chapter, enhancing effectiveness of assessment in online professional learning necessitates integration of authentic assessment activities and formative processes; and aligning these with learning goals. Additionally, fostering opportunities for shared responsibility in ongoing monitoring, assessment of learners' progress and achievements, and provision of formative feedback is emphasized. This is for purposes of ensuring adequate learning support in ways that promote learners' understanding of the learning goals and course content. The teacher's role as an expert facilitator is also critical in modelling and offering desirable learning support, a responsibility that may be shared with students in order to foster students' active involvement, autonomy and ownership of their learning.

The literature reviewed in this chapter including the theoretical underpinnings articulated here, suggest that ongoing and authentic assessment activities can blur the gap between learning and assessment of what has been learned. This is by enabling opportunities

for dynamic interactions and ongoing assessment, which is particularly crucial in online and distance learning settings. Application of online formative assessment from the viewpoint of authentic learning can promote meaningful learning. In the current study, meaningful learning was defined by manifestation of the following experiences: active cognitive engagement, contextual learning, interactive and collaborative learning communities, multidimensional perspectives, reflective learning and self-regulation. Inevitably, these meaningful learning experiences can potentially reduce the gap between learning to know and do, and performing to demonstrate knowledge for both formative and summative assessment in ways that support development of transferable competencies.

To this end, informed by the findings from the review of the literature related to application formative assessment in online settings and review of authentic learning theoretical perspectives, the researcher identified ten design characteristics (conceptual principles) of online formative assessment. These principles informed the in-depth investigation into the design, implementation, and evaluation of effectiveness of integrating formative assessment within online learning. These principles together with their key supporting citations are outlined below.

2.9.1 Conceptual principles for effective online formative assessment

1. *Offering authentic assessment activities which are relevant and meaningful to the learner's real-life situations and experiences, and are seamlessly embedded in the teaching and learning processes.* This requires provision of variety of assessment activities that are appropriately complex and have real-world relevance such that they actively engage learners in sustained critical inquiry (critical thinking and reflections) (e.g. Chung et al., 2006; Correia, 2008; Crisp & Ward, 2008; Duers & Brown, 2009; Feldman & Capobianco, 2008; Herrington et al., 2006; Lin, 2008; Mackey, 2009; Naidu, 2007; Shepard, 2001; Wang et al., 2008; Wiggins, 1993, 1997).
2. *Providing assessment activities that engage and support learners in individual construction of knowledge and meaning making.* This is through offering activities that recognize and allow learners to apply their existing knowledge and experiences to build new knowledge, and to demonstrate individually what they are capable of doing through individually created artefacts. Associated with this is that formative assessment requires incorporation of activities that illuminate learners' prior knowledge, and experiences (e.g. Chung et al., 2006; Crisp & Ward, 2008; Feldman & Capobianco, 2008; Gaytan & McEwen, 2007; Lin, 2008; Shepard, 2001; Smith, 2007; Wang et al., 2008).

3. *Offering assessment activities that provide learners with opportunities to construct knowledge collaboratively.* That is, activities that require and encourage learners to interact meaningfully with other online participants (teacher(s) and peers). This allows the learners to engage within a learning community and socially negotiate and construct meaning from multiple perspectives. Learners should also be able to articulate their position and validate meaning individually (e.g. Black & Wiliam, 2009; Crisp & Ward, 2008; Feldman & Capobianco, 2008; Lin, 2008; Oosterhof et al., 2008; Pachler et al., 2010; Shepard, 2001; Smith, 2007; Van der Pol et al., 2008; Vonderwell et al., 2007).
4. *Assessment activities require to be coupled with opportunities to provide formatively useful, ongoing and timely feedback.* Such opportunities facilitate learning scaffold and offer support to the learners in response to their questions, sought elaborations, misconceptions, solutions, defence of position. This responsibility requires to be shared both by the teacher and learners in order to be more productive. Associated with this is the requirement for teacher to model and encourage collaboration and peer formative feedback among students (e.g. Black & Wiliam, 2009; Chung et al., 2006; Dopfer & Sjoer, 2004; Gaytan & McEwen, 2007; Oosterhof et al., 2008; Pachler et al., 2010; Shepard, 2001; Smith, 2007; Sorensen & Takle, 2005; Van der Pol et al., 2008; Vonderwell et al., 2007; Wang et al., 2008; Wolsey, 2008).
5. *Assessment activities require to be accompanied by analytical and transparent rubrics that assist the learner to clearly understand the expected level of performance.* Associated with this is provision of relevant exemplars where possible. This in turn, provide opportunity for achieving shared understandings of the defined criteria and standards for performance which subsequently support students to assess and reflect on their own achievements in relation to the expected outcomes (e.g. Angus & Watson, 2009; Black & Wiliam, 2009; Chung et al., 2006; Gaytan & McEwen, 2007; Lin, 2008; Oosterhof et al., 2008; Pachler et al., 2010; Shepard, 2001; Smith, 2007; Wiggins, 1997; Wolsey, 2008).
6. *Providing assessment activities that create opportunities for learners to engage in meaningful reflections* about their learning processes and outcomes both individually and as a community. Meaningful engagement in reflection upon one's learning enable learners to self-assess and become responsible of their learning. This aspect is promoted by provision of authentic activities that are meaningful and relevant to individual learners (e.g. Crisp & Ward, 2008; Feldman & Capobianco, 2008; Lin, 2008; Pachler et al., 2010; Shepard, 2001; Wang et al., 2008).

7. *Provision of opportunities for ongoing documentation and monitoring of learner achievements and progress over time.* This fosters reflective practice as it helps learners to value, own, reflect on, and self-assess. Such opportunities support learners to mature towards self-regulation. As well, this promote opportunities to monitor evidence of students' growth, students to share their work with others, and enable the teacher to reflect on students needs (e.g. Gaytan & McEwen, 2007; Lin, 2008; Oosterhof et al., 2008; Shepard, 2001; Strudler & Wetzal, 2008)
8. *Achieving effective formative assessment requires the teachers to be more explicit in stimulating shared purpose and meaning of learning and assessment activities.* It is important to consider this as crucial as provision of assessment criteria and expected standards in order to support student to connect assessment activities to the learning goals and to perceive them as something that can lead to a meaningful outcome. Associated with this is modelling and creating opportunities for ongoing dynamic and dialogic interactions between and among the teacher and learners. This is essential in promoting shared understanding of learning goals and assessment requirements, active participation, and interactive learning community (e.g. Dopfer & Sjoer, 2004; Gaytan & McEwen, 2007; Lin, 2008; Pachler et al., 2010).
9. *Provision of assessment activities that involve learners in multiple roles.* For instance, opportunities for decision-making by allowing them to decide specific tasks and procedures to enable them accomplish the activity as well as providing opportunities to negotiate and apply rubrics, and provide feedback to peers (e.g. Black & Wiliam, 2009; Chung et al., 2006; Lin, 2008; Oosterhof et al., 2008; Pachler et al., 2010; Shepard, 2001; Vonderwell et al., 2007).
10. *Provision of assessment activities that are flexible and open-ended in order to provide room for multiple approaches and solutions.* This provide learners with diverse opportunities to demonstrate their understanding and competencies which may also support the learners towards self-regulated learning (e.g. Black & Wiliam, 2009; Gaytan & McEwen, 2007; Lin, 2008; Shepard, 2001; Smith, 2007; Vonderwell et al., 2007).

As detailed in the following chapter, which presents the methodology used in this research, these conceptual principles were applied within the case study methodology to guide data collection and analysis processes.

Chapter 3

3.0 Methodology

3.1 Introduction

This chapter describes the research methodology and design employed in this study to address the research questions. The chapter also offers a supporting rationale for the adopted method and design, and the underpinning paradigm. Guided by the theoretical principles identified in Chapter 2 (Section 2.9.1), this chapter describes the data collection and analysis techniques. The procedures applied to ensure validity and reliability of this study are also presented. Finally, ethical considerations are discussed.

3.2 The research method, design and the rationale

The current research adopted a case study methodology. Employing a case study methodology provided an opportunity for in-depth understanding of how to apply formative assessment within authentic online learning settings. Case study methodology offered a means to closely explore the phenomena, describing the cases with as much details as possible, followed by an analysis of the evidence obtained in a clear and comprehensive manner. The strengths of utilizing a case study research methodology have previously been noted by various authors (Simons, 2009; Yin, 2009). In articulating these strengths, Yin noted that case study method offers an opportunity to investigate a “phenomenon in depth and within its real-life contexts, especially when the boundaries between the phenomenon and its context are not clearly evident” (2009, p. 18). Case study methodology provided the researcher with enriched opportunities to understand the phenomenon in depth and elucidate pertinent contextual conditions. It also guided collection of data from multiple sources while also capturing complexities and particularity of the context (Yin, 2009); thus providing sufficient evidence for making informed conclusions about the effectiveness of online formative assessment and critical features for its success.

This study encompassed a multiple-case design (Yin, 2009) that constituted two embedded individual cases of online postgraduate courses with embedded units of (case) analysis. The multi-case design and embedded units of analysis are described further in Section 3.4. The individual cases were conducted, analyzed and reported separately in

Chapters 4 and 5 respectively. This was followed by a cross-case analysis that sought to achieve holistic understandings of the findings of both case studies. This research was therefore a collective case study (Simons, 2009) that encompassed two individual cases in which the findings of both cases were aggregated to gain collective understanding of the phenomenon under investigation. The research was explanatory (Yin, 2009) because its purpose was to offer pragmatic understanding of *how* best to integrate formative assessment in online learning environments. According to Yin, to ‘explain’ a phenomenon is “to stipulate a presumed set of causal links about it, or “how” or “why” something happened” (2009, p. 141).

3.3 The underlying research paradigm and philosophical assumptions

The multiple-case study design encompassed multiple techniques in data collection and analysis which provided opportunities for depth and breadth in understanding the experiences and perceptions of the research participants. This research was underpinned by a pragmatic paradigm. As articulated by Creswell (2003) and other scholars (e.g. Lodico, Spaulding, & Voegtler, 2006), a pragmatic paradigm emphasizes application of all possible approaches that can help the researcher to best answer the research question. Based on these authors, a paradigm is not limited to any single world view or philosophical assumption but draws on diverse views to best meet the research needs and purposes at hand. This paradigm permits the researcher to apply multiple techniques in data collection and analysis framed within the chosen research design that fit their purpose.

To adequately answer the research questions, this pragmatic paradigm was biased towards a qualitative interpretive approach to facilitate an in-depth exploration of a phenomenon that was characterized by human subjects within its naturalistic context. As conceptualized by various authors (e.g. Lincoln & Guba, 2000; Mertens, 1998; Neuman, 2000, in Creswell, 2003, pp. 8-9), an interpretive perspective is rooted within social constructivism philosophy and assumes that individuals seek subjective meanings of their experiences within a naturalistic context. “These meanings are varied and multiple, leading the researcher to look for complexity of views rather than narrowing the meaning into a few categories or ideas” (Creswell, 2003, p. 8). Interpretive perspectives (e.g. social constructivists) are particularly opposed to the positivist perspectives (e.g. scientific realists)

which suggest that reality can be reduced to its component parts or distinctly categorizable variables. Instead, interpretivists argue that, the “phenomena must be understood as complex “whole” that are inextricably bound up with the historical, socioeconomic, and cultural contexts in which they are embedded” (Lodico et al., 2006, p. 8). These interpretive perspectives were relevant in this study and therefore the researcher sought sustained interactions with the participants from the outset, and assumed an open-minded focus with an aim to gather as much as possible about the participants’ meanings and richly understand the phenomenon within its context. As Bryman (2001) suggested, this helped the researcher to enhance her understanding of the participants’ meanings from their viewpoints, which enhanced accuracy in interpretation of observed meanings.

Notwithstanding the advantages of interpretive approach, the researcher acknowledged the possibility that these interpretation of meanings would also be shaped by participants’ knowledge and experiences including herself as a participant observer. Therefore, while taking advantage of interpretive perspectives, the researcher was also keen to minimise bias possible from inherent subjectivity in order to enhance rigour and achieve more credible findings. In this study, the researcher sought to maintain sustained interactions with the study participants with an aim to obtain a rich picture of their experiences while also attempting to minimise bias; thus enabling appropriate equilibrium between subjectivity and objectivity. Objectivity is a notion that predominantly emphasizes the researcher’s detachment from the participants’ experiences with the aim of maintaining rigour and reducing bias (Lodico et al., 2006). Another continuum between positivism and interpretivism to point out is that this research was guided by a theoretical framework in which the data collection and analysis processes were framed by conceptual propositions while at the same time the researcher remained open-minded to accommodate unanticipated aspects or issues. Creswell (2003) noted that, “rather than starting with a theory as in postpositivism, interpretivist inquirers generate or inductively develop a theory or pattern of meaning” (2003, p. 9).

These pragmatic perspectives were congruent with the case study methodology and the adopted multiple-case design in which qualitative techniques were emphasized in data gathering and analysis procedures while fittingly integrating descriptive quantitative data. As noted by Creswell (2008), such a pragmatic approach facilitated the researcher to capitalize on qualitative techniques to exhaustively explore the phenomenon within a context, through

observing chronological events of case processes, and participants' activities, as well as understanding their experiences and perceptions in their naturalistic settings. Descriptive quantitative data was used to complement and extend the meaning of qualitative data from multiple sources which were subsequently triangulated. Through these multiple techniques, it was possible to provide a rich and in-depth account about the phenomenon and its context, which in the current study was to systematically investigate 'the design and implementation of formative assessment within online postgraduate courses, and to establish its impact on students' learning experiences within the context of ICT education for teachers.

3.4 Selection of cases and the unit of analysis

The two case studies (of online courses) were bound by common phenomena (as noted above) and were within the same postgraduate programme and the same university online setting. Following the guidelines suggested by Stake (2006), the two case studies in this research were selected on the basis that:

- (a) They encompassed the phenomena of interest for this study.
- (b) They represented diverse situationality (as described in a subsequent paragraph) that provided good opportunity to learn more about complexity of the context.
- (c) These cases were accessible and hospitable. The teachers' avid support (as key participants) in facilitating ethical approval by the university was also vital to accessibility of the selected courses.
- (d) The two selected cases were rich in content, for instance, the teachers' pedagogical philosophies and approaches aligned with the variables that were key to the phenomena under study. Additionally, both teachers were passionate about the study topic as experienced online educators and researchers who were persistently interested in enhancing their pedagogical knowledge and practice. The teachers were willing to go beyond being ordinary research participants to supporting the researcher as key informants (Lodico et al., 2006; Yin, 2009). According to Lodico et al. and Yin, key informants are research participants who are more knowledgeable or informed about the research participants and its context, and therefore they are in a better position to provide rich insights relevant to the study phenomena. This is especially helpful in uncovering data that may not be obvious to the researcher as an 'outsider' in that group. In this study, both teachers as key informants

became an ongoing source of evidence beyond the formal data collection phase as the researcher maintained constant interactions with them. This supported the researcher to enrich the already gathered data and obtain some useful insights. These additional insights enriched the evidence obtained that maximized what could be learned from this study.

From the outset of this study, the researcher was keen to discern varying contextual influences between the two cases in order to account for contextual conditions (situational diversity) across the cases. Based on the study focus, what was considered as the main contextual difference between the two courses (cases) was the specific course content. By implication, this led to differences in course structure and duration, hence varying course designs. Such differences were assumed to have contextual influences. Other contextual differences arose from the following aspects: each of these two courses had a different teacher, and varying number of student participants with diverse demographic attributes. The students also had different levels of prior experiences in online learning. As Stake (2006) suggested, programmatic and demographic variations may have contextual influences or conditions. Stake (2006) also notes that other unexpected influences may arise. Such influences had some implications for the research findings. Influential aspects included diversity among learners in relation to their previous professional experiences. These influences are explained in latter chapters where relevant.

Designed as a multiple-case study (Yin, 2009) with multiple units of analysis embedded, this study comprised two selected online cases (courses) which constitute a 'whole' case study in which each course constitute an 'embedded case' as the (first-level) unit of case analysis. In turn, each of these individual cases encompasses the students and the course as the (second-level) embedded units of case analysis. The multiple-case design was chosen to facilitate replication of the findings across the two case studies (Yin, 2009), and the analysis across the cases sought to explain how and why a particular assertion was exemplified (or not exemplified) within the individual cases. The replication logic aimed at enhancing external validity of the current findings as noted by Yin (2009) and, by implication, this enhanced their (analytic) generalization. This suggests that the current findings may be (to some extent) transferable to other contexts. According to Yin (2009), analytic generalization implies that the readers of case study findings have responsibility to distinguish what is flexibly adaptable to other contexts.

3.5 The specific context of the selected cases and research participants

The two selected cases were online courses within an ICT in Education programme which was hosted within a web-based learning management system (LMS) of a NZ University. These courses are offered in online (asynchronous) mode and they mainly target distance learners across NZ and overseas. The initiative to offer these courses as part of the university programme, in part, arose in response to opportunities emerging from the broader context as described earlier in Section 1.3. These courses are part of a postgraduate Diploma and a pathway to Masters in Education (MEd) programme. The courses are aimed to support teachers and other educational professionals to develop knowledge and skills in variety of ICT-related competencies, and their applications to teaching and learning within face-to-face, blended and online contexts.

These courses typically attract graduate teachers and other professionals working in a variety of sub-sectors in education. The students enrolled in the two courses were mainly practicing teachers and other educational professionals who were interested in furthering their professional education. The research participants comprised the teacher (who was also the course designer) and the students who were enrolled in each of these courses. The researcher was also a participant observer in both courses.

The two cases were conducted sequentially but they overlapped during the research period. The two courses (pseudo-named Course 1 and Course 2) were offered within the university year 2010 for a period of two and one academic semesters respectively. To maintain anonymity in this study, pseudonyms are used when referring to the selected courses, students, and teachers participants. Any other identifying information is also blurred within the captured screenshots in subsequent chapters.

3.6 Data collection and analysis

3.6.1 Application of the theoretical framework

As articulated by Yin (2009), application of a congruent theory in this study supported the researcher to define and maintain a relevant focus for data collection. Additionally, the theory offered a framework for interpreting the current findings to achieve systematic coherence and conceptual generalization. In particular, data collection and analysis within the individual cases was guided by the research questions and themes derived from the conceptual and

theoretical principles of effective online formative assessment that were informed by review of the relevant literature and authentic learning theoretical perspectives (see Section 2.9.1).

The ten conceptual principles as identified in the preceding chapter were further interpreted with respect to the research question to develop more precise criteria as shown in Table 3.1. From these interpretations, four major elements were identified to encompass these criteria: nature of the assessment activities, clarity of assessment tasks and expected outcomes, ongoing documentation and monitoring of evidence of learning, and formative feedback. These criteria provided a useful guide during the data collection and analysis processes.

In addition to the anticipated criteria (as described in Table 3.1), the researcher took note of additional issues and aspects that emerged as the study progressed, and keenly considered emerging issues/aspects during analysis provided that they were relevant to the research questions. Such emergent aspects included: the nature of social interactivity and how it influenced formative processes; learners as a source of learning resources; and the diversity of learners' perspectives that was framed within their lived experiences as knowledgeable professionals. Being open-minded to unanticipated aspects or issues was useful in enabling the researcher to uncover a rich picture about the participants' experiences and the research setting. Stake (2006) has previously noted the possibility of case study researchers being overly influenced by predefined themes and therefore highlighted the necessity to remain open-minded in order to accommodate unexpected themes/issues which might be of relevance to the study. Yin (2009) also identified the need to avoid being over influenced by predefined procedures and hypotheses and recommended paying attention to new discoveries that may emerge in the course of case study research in order to exploit opportunities for further evidence and ensure quality research.

Table 3.1: Guiding criteria for data collection and analysis in the selected cases

Element	Specific criteria for each element
Nature of the assessment activities	<ul style="list-style-type: none"> ➤ Are assessment activities ongoing and integrated within teaching and learning processes? ➤ Are the assessment activities relevant in real world contexts? ➤ Are the activities appropriately complex, requiring the learner to define sub-tasks and procedures needed to accomplish the activity? ➤ Are learners required to play different roles? ➤ Do the activities require sustained period of time to complete? ➤ Are the activities allowing learners to apply their existing knowledge and experiences? ➤ Are the activities flexible? (multidimensional - do they allow diverse task, approaches and outcomes) ➤ Are learners stimulated/required to utilize variety of resources? ➤ Are the activities integrating reflective discourse? ➤ Are there opportunities for collaboration/collaborative tasks? ➤ Are the expected products meaningful: Are there variety of assessment activities that are progressively developing into a more complete whole (or building a bigger picture)?
Clarity of learning goals and expected outcomes: enhancing understanding /clarity of assessment guidelines and rubrics	<ul style="list-style-type: none"> ➤ Is openness and transparency of guidelines and rubrics evident? ➤ Are there opportunities for ongoing interactions to enhance understanding of assessment requirements and rubrics? ➤ Is there evidence of flexibility of rubrics, negotiability and reviewing over time? ➤ Are the rubrics Analytical: comprehensive criteria and standards (indicating the range of performance) in relation to specific levels of achievement expected (predetermined qualities)? ➤ Are relevant exemplars provided where applicable?
Ongoing documentation and monitoring of evidence of learning	<ul style="list-style-type: none"> ➤ Evidence of variety of learning/assessment products/artefacts archived progressively? ➤ Are there opportunities for the teacher to gather information about students' learning and progress? ➤ Processes can be monitored - is students work easily accessible and compact? ➤ Sharing of learning processes and products (artefacts) is supported?
Ongoing formative feedback	<ul style="list-style-type: none"> ➤ Is feedback formatively useful – related to quality/adequacy of feedback (actions and/or responses)? ➤ Is feedback characterized by immediacy and timeliness? ➤ Is feedback the responsive and tailored to students' learning needs? ➤ Is feedback easy to understand? ➤ Is feedback ongoing and integrated into products and/or processes? ➤ Is feedback (teacher's feedback) evident as a means of scaffolding learning; offering indirect answers (reflective feedback) such as offering references and hints as well as asking leading questions? ➤ Are opportunities for peer-peer formative feedback evident? ➤ Is the feedback interactive? ➤ Are there mentoring opportunities (at least for students with intensive difficulties)?

Data from each of the two individual cases, Case 1 (Course 1) and Case 2 (Course 2) was gathered, and analyzed separately. Subsequently, that analysis formed the basis for cross-case analysis that focused on re-examining findings of both cases to discern and interpret the key assertions in order to achieve holistic understanding of how to effectively apply formative

assessment in online learning environments, while also elucidating critical elements that can help (or hinder) the effectiveness with the context of ICT-related professional development for teachers. The techniques applied in data collection and analysis within and across the cases are described in the following sections.

3.6.2 Data collection

As noted earlier, the case study methodology provided an opportunity to utilize both qualitative and quantitative data collection techniques to gather evidence from variety of sources, which facilitated triangulation of data for purposes of corroborating the evidence obtained. The following data collection instruments were utilized in this study:

- (a) Online observations and researcher observational journal
- (b) Survey questionnaire
- (c) Archival and artefact analysis
- (d) Semi structured interviews

Each of these instruments is described below.

(a) Online observations and the researcher observational journal

The researcher was a participant observer from the outset of each course and thus an ‘insider’ with a minor role which was negotiated with the course designer (who was also the teacher). Being an insider enabled the researcher to strategically observe the course events and processes, and participants’ activities, which provided opportunities to better understand the course participants’ experiences within a context. Being an insider also enabled the researcher to build positive relationships with the participants. The minor role of researcher assisted her to avoid interrupting the settings; and being overly influenced by the insider role, thus minimizing possible bias.

In order to maintain a relevant focus, the online observations were guided by the criteria presented in Table 3.1. This is consistent with Bryman’s (2001) guidelines, which suggest that structuring observations through devising an observation criterion can be useful in achieving focused observations. The participants’ activities and products within the learning and assessment processes were observed throughout the duration of both courses. The researcher also observed patterns of interactions among the course participants. The researcher’s observations were recorded in a journal as the case processes and activities

evolved. The researcher recorded her observations twice a week and reviewed these periodically upon her reflections on the notes. Sometimes, conversations with the course also prompted the researcher revisit her initial understandings of participants' experiences and perceptions. Screenshots of the key aspects of the course structure were also captured. The researcher reflected on insights emerging from the online observations and interpreted them in relation to the key themes underlying the research questions.

It is also important to note that there was thin line between online observations and analysis of the archived course content. However, the archiving of discourse in both online courses did not reduce the importance of observing participants online. One aspect that was useful to the researcher was how the insights obtained from online observations expanded her thinking and interpretations in relation to what aspects characterize formative assessment and how they were discernable in both courses. Deeper meanings of participants' actions and experiences emerged progressively to the researcher through the ongoing observations. An example of such evolving understandings relates to one of the targeted formative assessment aspects described as follows: the meaning of the nature and what was valued as exemplars in each course evolved with time. Initially, there were a variety of exemplars which both teachers had provided where they deemed relevant; and the students valued these. In addition, as the course progressed, the students appeared to value their peer's work as additional exemplars. This aspect was supported through providing the course participants with opportunities to interact with the ongoing assessment work of their peers. Other additional exemplars emerged as part of peer learning support as the students injected additional resources within peer-peer feedback and/or as their contributions to the collaborative discourse in the discussion forums. Through such evolving experiences among the participants, the researcher was able to derive multiple meanings of an issue or aspect, which also prompted her to dig deeper to uncover underlying meanings that were not necessarily overtly observable. Therefore, researcher's role as a participant observer in both courses richly informed analysis and interpretations of the archived course content.

(b) End-of-course survey questionnaire

Data obtained from observations and preliminary examination of the course input was used to inform the design of the end-of-course survey questionnaire. The questionnaire data aimed to gain an understanding of students' perceptions with respect to items denoting different

attributes associated with their experiences from engaging with online formative assessment. The questionnaire comprised 28 closed-ended questions, which were measured using a five-point Likert scale (0= Not at all; 1= Small extent; 2= Relative extent; 3= Great extent; 4= Very great extent). The scale was considered as an ordinal scale (rank-ordered) rather than an interval scale because there was no guarantee that the distance between each scale item value was equal (Creswell, 2008, p. 176). The questionnaire also had 3 open-ended questions, which permitted the students to descriptively express their experiences/views using their own 'language or voice' thus enriching the data. The same survey questionnaire was used in both cases but it was adapted accordingly to fit with the specific aspects in each course.

To enhance the instrument reliability, the survey questionnaire was piloted with six volunteer colleagues who were also studying ICT in education, who provided feedback that assisted the researcher to revise the questionnaire and ensure that the questions were visually appealing to the respondents and there were no items that were ambiguous, leading, double-barrelled, or too long. The questionnaire was also reviewed by the research advisors for its appropriateness to gather the data. These characteristics have been identified as necessary in achieving a valid and reliable questionnaire (Bryman, 2001). The survey was conducted online (using SurveyMonkey tool) and the link to the survey questionnaire was distributed to the participants in both cases via e-mail. The survey was secured with Secure Sockets Layer (SSL) to enhance security over the Internet.

(c) Archival and artefacts analysis (the documented course data)

This entailed critical examination of course data as a key source of evidence. During observations the researcher had identified and noted various input that appeared to be rich as raw data segments for coding and subsequent analysis. Screenshots of relevant course processes and activities taken during the case period were reviewed. After the official course(s) duration, all the course data generated through the teacher's input and the online discourse for the entire course was archived within the LMS database. This process was supported by the university technical staff with consent from both teachers and students. As one of the key data sources, the archived course data was consulted frequently as and when need arose during the research process. The archiving of data within its original context provided the researcher with an opportunity to gather evidence within its naturalistic context, which ensured its completeness.

(d) Semi structured interviews

Interviews provided an opportunity for in-depth data gathering and further understanding of the data obtained from the other sources and was thus considered a key source of data. In designing the interview questions, the researcher was guided by the research questions and the insights obtained from the researcher observational journal, survey questionnaire, and preliminary analysis of the archival and artefact analysis. The interview questions were semi-structured to maintain a relevant focus while also allowing individual participants to voice their experiences and perceptions without being constrained by the researcher's perspectives. To verify the quality, the interview guide was reviewed by informed colleagues and the research advisors who double-checked that the questions were unambiguous, not leading, and to ensure that the questions were amiable to the respondents and appropriate to provide the targeted data. Bryman (2001) identified the importance of these aspects in enhancing the quality of an interview guide. The interview guides for the teachers and students in each course are presented in appendix 2. The interview questions were similar in both cases but they were adapted for the specific differences in the courses' assessment activities. The teachers' interviews (at the start and the end of the course) focused on their experiences and views about pedagogical implications for the design of online formative assessment, and how this influenced students' learning experiences. The interviews with the student participants (at the end of the course) focused on individual learning experiences and perceptions in relation to the course learning and assessment activities and processes. All interviews were recorded and subsequently transcribed by the researcher to facilitate the analysis.

3.6.3 Researcher's role and experiences as a 'participant observer' during the data collection phase

Through the courses' hospitality, the researcher gained access to both courses with an opportunity to become an insider in the role of a participant observer. This was possible because all the students in both courses had agreed to be observed. Taking an insider position provided the researcher with an opportunity 'to experience the participants and to experience with them'. This happened as the researcher interacted with the teachers as a collaborator course designer with a minor role. In particular, the researcher collaborated with both teachers

in designing and appraising the mid-course formative evaluation survey in both cases. In Case 1, the researcher sometimes interacted with the student participants within the course discourse through occasional participation in the online discussion forums as a co-participant. However, the researcher did not participate within case 2 online discourse in order to avoid being an interruption to the setting due to the nature of the course structure. The researcher was keen to minimise possible bias and to avoid being immersed as a full insider from her insider position in both courses. One way to reduce bias was to maintain her interactions with participants to an appropriate level and avoid interrupting the setting. The researcher mainly concentrated on observing participants' experiences and reflecting on what this meant from the participants' perspectives, and how it fitted her interpretations with respect to the research question. These ongoing interactions with participants' experiences enabled the researcher to achieve enriched understanding of research participants and the context, as her thinking kept shifting back and forth with clearer understandings emerging over time.

As noted earlier in Section 3.6.2 (a), one of the key aspects that the researcher experienced was the thin line that was obvious between observations and analysis of archived course data which arose from the online nature of the case study setting and the progressive archiving of the course discourse. The archiving of all course discourse was particularly useful during the detailed data gathering and analysis phase because the researcher could follow all the events in the online setting, including participants' actions and experiences, even after the official end of the course.

Moreover, the role of a participant observer enhanced opportunities for ongoing interaction with both teachers as key informants which was particularly useful in uncovering meanings that were not obvious to the researcher. Use of multiple data collection tools was also useful in enriching the researcher's understanding about students' experiences and perceptions.

3.6.4 Data analysis

This phase of research involved analysis of data obtained from the variety of sources utilizing both inductive and deductive analytical procedures.

3.6.4.1 Analysis of qualitative data

The analysis of qualitative data was based on Miles and Huberman's (1994) approach to qualitative data analysis. The analysis process was iterative and entailed three phases as follows: (a) data reduction, (b) data display, and (c) data conclusions and verifications. These processes have also been recognized as appropriate for analyzing qualitative data by other authors (Creswell, 2008; Richards, 2009; Simons, 2009; Yin, 2009).

(a) **Data reduction:** This was the initial phase and it entailed selecting, coding and condensing of the content from two key data sources: archived course content, and interview transcripts. While the researcher was keen to scrutinize all the available data at the outset of the analysis process, the researcher eventually selected sub-sets of data that were rich with respect to the research questions. The coding of the selected data was iterative, and involved both inductive and deductive logic. At the initial coding phase, care was taken to preserve as much detail as possible and this was mainly an inductive process (based on observable meaning) to minimize subjectivity and interpretive bias. As identified by various authors (Rourke, Garrison, Anderson, & Archer, 2001; Wever, Schellens, Valcke, & Keer, 2006), this enhanced objectivity and reliability of the coding process. Nvivo software version 9.0 was used to support the coding process.

The event sampling technique as applied in Van der Pol et al. (2008) was used to determine initial coding decisions in which a new theme was initiated each time a new issue/topic emerged. The selected data were organized, summarized, and coded into themes until no more new themes emerged. This was considered as saturation of the emerging themes in that raw data segments did not provide any new information or insights for new themes or develop the already identified themes. These initial themes were not mutually exclusive as they overlapped. The initial themes identified were further aggregated into broader thematic units (unit of meaning) based on the key elements of the research question as previous outlined in Table 3.1. As some researchers (Rourke et al., 2001; Wever et al., 2006) indicated, such a systematic technique enhances replicability of the coding scheme.

The coding process was reviewed to check for redundancy and to ensure consistency, hence enhancing intra-coder reliability. A volunteer reviewer was also invited to verify the coding consistency through independently coding segments of data that were randomly selected from the gathered data. The reviewer as a second coder was first taken through an

induction process to familiarize with the data and understand the coding criteria.

Subsequently, the coding decisions made by the two coders were compared and discrepancies between the codes were resolved through re-examination of the coded data by the two coders as a team. The researcher had more coding decisions than the invited coder in this coding process that achieved values ranging 0.70 to 0.85 for inter-coder reliability based on Holsti's (1969) *coefficient of reliability*. These values indicate reliability the data coding process in the current study. Inter-coder reliability (inter-rater reliability) is "the extent to which different coders, each coding the same content come to the same coding decision" (Rourke et al., 2001, p. 11). This is derived from: Double (x2) the number of coding decisions upon which the two coders agree divided by the sum number of coding decisions made by coder 1 and 2 (Holsti's, 1969, in Rourke et al., 2001, p. 11). A value of 0.70 in inter-coder reliability has been noted as reliable and good agreement beyond chance, values above 0.75 are considered as excellent agreement beyond chance, whereas values below 0.4 are considered as poor agreement beyond chance (Wever et al., 2006). In this study, inter-coder reliability is agreeably satisfactory with values ranging 0.70 to 0.85. The unresolved discrepancies (differences in the number of coding decisions) between the two coders are not surprising due to the fact that the invited reviewer had limited understanding of the data as a result of his minor involvement in this study. This notwithstanding, involving a second coder provided the researcher a good opportunity to reflect on the coding process and critically re-examine the coding decisions to ensure the data were exhaustively and appropriately coded.

(b) Data display: This phase entailed organizing the coded data into matrices and charts to visualize the data. This facilitated qualitative thematic analysis, which entailed layering themes to establish and describe interrelationships, which informed understanding of the data and reporting of the results. Additionally, as described in the following paragraphs, this informed interpretive analysis.

(c) Drawing and verification conclusions: This phase entailed two levels:

- Generating meaning through interpretations of the results, and
- Confirming/verifying those interpretations.

Various tactics were applied to generate the meaning of the results. These included building a rich and coherent chain of evidence, identifying and verifying emerging patterns of themes

and validating their relevance based on the key concepts of the research question and building explanations to generate meaningful interpretations of the results.

The findings were verified through the following ways: (a) following up of the unexpected by going back to re-examine the raw data segments to inform possible explanation. (b) through member checking with the participants to verify accuracy in attention to their voice in which the interview transcripts were sent through email to individual participants for review. (c) both teachers as key informants (as described earlier) played a key role in verifying the completeness and accuracy of the evidence obtained. This was an ongoing process after the formal data collection phase in which the researcher had ongoing interactions with both teachers with the aim to verify her understanding of the data gathered with respect to the research setting, and the research participants' activities and shared experiences. Within these processes, the researcher requested the teachers to review the reported cases as chapters to verify the researcher's accuracy in interpreting the gathered data. The ongoing interactions with both teachers also entailed collaborations in co-authoring to publish the findings in peer-reviewed journals and sharing in educational conferences. The teachers' probes and views during these interactions prompted the researcher to revisit the raw data for better understanding, re-examine her interpretations and consider other relevant perspectives of interpreting the data. As such, these processes served as an opportunity for obtaining additional evidence and validating its meaning. To enrich credibility of the findings, the data obtained from multiple sources was triangulated to seek for convergence (or divergence) of the evidence. These processes were interwoven and iterative throughout the data analysis phase.

Additionally, broader interpretations of the findings were sought during the cross-case analysis. This involved taking the thematic patterns emerging from the individual case findings and comparing them across the cases in order to discern and interpret assertions that converge (or diverge), and establishing systematic (conceptual) coherence through clustering patterns and elucidating overarching meanings. Subsequently, the key findings were interpreted from a conceptual perspective through linking back to the related literature and generalizing to broader theory.

3.6.4.2 Specific procedures in analyzing qualitative content

The criteria described earlier in Table 3.1 informed the coding criteria to uncover the relevant themes from the raw data. The initial themes emerging from each qualitative data source were examined for commonality and then pattern coded into relevant broader sub-themes and major themes. As it emerges in subsequent paragraphs, the case study design mandated adoption of multiple units of data coding (units of data analysis) to fit the multiple qualitative sources of data within the embedded units of (case) analysis described earlier. The analysis of data from the multiple sources was done as follows:

a) Archival and artefact analysis of the course data: This entailed analysis of the data as contributed online by the course participants. Each individual posting (single message as posted online by an individual course participant) within the online forums was identified as the unit of data analysis during initial coding of data. A single post was considered as an appropriate unit of data analysis because the messages were clearly demarcated, and thus enabling the researcher to consistently identify coding units. A single post within the LMS as a unit of data analysis was an original message as authored by a student or the teacher. As previously recommended by Rourke et al. (2001), and Wever et al. (2006), this approach enhanced the researcher's ability to explicitly and consistently make appropriate coding decisions. The focus of interest in the coding process was to identify facets of formative assessment from the transcripts of the online discourse in each course. Subsequently, the initial themes emerging from the course data were mapped into broader sub-themes and themes. These broader themes were then pattern-coded into major themes in relation to their relevance in answering the research questions.

b) Analysis of interview transcriptions: A transcript for an individual research participant was considered as the first-level unit of data analysis. In addition, the content from interview transcriptions was coded based on issues or topics being addressed by each interview question which was considered as a second-level unit of data analysis. This coding criterion is referred to as thematic unit of data analysis (Rourke et al., 2001) where a single idea that conveys a single unit of meaning is extracted from segment of a transcript. Emerging issues/themes were then fitted into the four major themes as described earlier. The coded interview transcripts were re-examined in depth with an aim of identifying the rich aspects of

formative assessment from the participants' viewpoints in relation to their experiences in the courses.

c) ***Other data sources (online observations and survey data)***

Researcher observational journal: The researcher journal that had been maintained through the cases' duration was reviewed to further re-examine the relevant insights that had emerged during observations. The issues and insights emerging from online observations were re-examined to inform the in-depth data collection and analysis process through the course data (archived online course discourse) and the interviews. The *data from the survey responses* served a preliminary role in which students' survey responses were examined and the insights obtained in relation to the students' experiences and perceptions were explored in-depth during the interview for better understandings. The researcher chose not to include the data from survey responses when reporting the study findings because it was insubstantial compared to the rich data that was available from other sources.

3.6.4.3 Analysis of quantitative data

Being a case study research with a bias on qualitative approaches, the current study did not seek statistical significance. Case study methodologies do not necessarily seek statistical generalization (Stake, 2006; Yin, 2009). Instead, the priority is to achieve rich and deeper understanding of the phenomenon within a context that compels analytic generalization as opposed to making inferences about the entire universe. As such, non-parametric (descriptive) statistical techniques as described by Palant (2007) were considered appropriate during data analysis. The applied descriptive statistical techniques included tabulating frequencies and relative frequencies for the themes emerging from the various data sources.

Other sources of quantitative data were elements of the online course discourse archived in the LMS. This was particularly the postings within the topical discussion forums and other forums. Due to the superficial nature of these quantitative measures in relation to revealing the targeted variables of the phenomenon under study, the quantitative data were only considered as supplementary and were used to extend the meaning of qualitative data where appropriate by being integrated within the qualitative interpretations of the findings. In particular, the quantitative data was used to describe and interpret the qualitative meanings, and making their internal generalization more explicit.

3.6.5 Data triangulation

The multiple sources of data supported the researcher to obtain rich evidence in relation to the phenomenon under investigation and account for contextual conditions. Data triangulation was preceded by coding of qualitative content from the various data sources through identifying the initial themes emerging from the raw data sets. The recurrence (cumulative frequencies and the relative frequencies) of individual themes in each of these data sources were also tabulated to facilitate triangulation.

The initial themes from each source of data were clustered into common sub-themes and then fitted into the identified major themes. Subsequently, triangulation was done to establish convergence (similarities) and divergence (dissimilarities) across evidence obtained from various data sources (Creswell, 2008; Yin, 2009). As suggested by these authors, the emerging similarities supported the evidence from other sources, thus enhancing internal validity while dissimilar evidence formed the basis for revisiting the raw data sets to seek for further explanations. After triangulation, the findings of both cases were integrated for holistic and in-depth interpretation of meanings through cross-case analysis, and linking back to the relevant literature and theoretical underpinnings.

3.7 Validity and reliability of the current study findings

Validity and reliability of the current research findings was ensured with the aim to achieve credibility and dependability of the research findings and conclusions. It is important to point out that this two-case study applied qualitative criteria in ensuring validity (credibility) and reliability (dependability). Such an approach has been recommended as appropriate in qualitative research (Lodico et al., 2006; Miles & Huberman, 1994). According to Lodico et al. (2006), credibility refers to “whether the participants’ perceptions of the setting or events match up with the researcher’s portrayal of them in the research report” (Lodico et al., 2006). Various ways of enhancing validity were sought to ensure that the evidence gathered yielded accurate and rich picture of the participants’ meanings and the research context (Lodico et al., 2006). Firstly, validity was enhanced through gathering data from multiple sources. As noted earlier, multiple sources of data facilitated data triangulation that was done by converging the data to corroborate the evidence thus enhancing validity. Triangulating of data from variety of sources allowed corroboration of evidence about the same variables of the phenomenon under

study which enhanced validity and reliability of the research findings. These benefits of multiple sources of evidence and data triangulation have been previously identified by Yin (2009).

Secondly, being a multiple-case study, validity was also enhanced by replication design across the two individual cases. Miles and Huberman (1994), and Yin (2009) have noted that, replication logic through multiple-case design can enhance external validity of the findings and thus increase *analytic* transferability of the findings to other contexts. Analytic transferability implies that readers have the responsibility to discern what is flexibly adaptable to their own specific contexts. Validity was also enhanced by integrating the findings of both cases through the cross-case analysis and conceptual (theoretical) generalization of the key findings to broader theory, which both Miles and Huberman (1994), and Yin (2009) have suggested as possible techniques for enhancing validity.

Thirdly, the researcher was a participant observer in both cases throughout the courses duration. Crossouard (2008) identified the benefit of being a participant observer. Such benefits include the opportunities to perceive reality from an insider viewpoint as opposed to an outsider viewpoint which enhanced reliability of the evidence obtained. Taking an insider role promoted positive relationships with the participants. Paying attention to Yin's (2009) recommendation, care was taken to maintain rigour and reduce bias despite being a participant observer. As a way of minimising bias, the researcher was keen to continually monitor own subjective perspectives by reflecting upon the notes recorded from the online observations and in some cases checking out with the teachers. As detailed earlier, the researcher sustained interactions with both teachers as key informants and collaborators in publishing the study findings was another useful means applied to enhance validity. These processes were particularly helpful in reducing the researcher's bias and in providing a rich, complete and accurate account of participants' experiences and perceptions within a context, thus enhancing validity of the current findings.

Finally, the research instruments (questionnaires and interview guides) were reviewed and piloted with informed colleagues who were not participants in this study to check ambiguity and ensure consistency. Furthermore, the research instruments and processes were subjected to experts' moderation, particularly the research advisors. In addition to the two formal cases, the researcher participated in two other courses informally. In these two courses,

the researcher had been invited to work and learn alongside an expert online teacher/designer who was also interested in applying formative assessment in her courses. These courses served as pre-pilot (informal) studies and could not be reported formally due to ethical constraints. In one of these online courses, the researcher participated in the design and teaching of an online course as a part-time co-teacher/designer. This was preceded by researcher participation in another online course as a learner and teaching assistant while informally observing and examining the course processes and activities from a 'formative assessment perspective'. As Yin (2009) noted, such prior involvement in similar research setting provided the researcher with some valuable insights, which informed the processes and procedures when investigating the formal cases.

Reliability was also sought to ensure that the research processes and procedures were replicable and would achieve similar results (Lodico et al., 2006). According to Lodico et al. (2006), reliability in qualitative research relates to dependability through ensuring that "one can track the procedures and processes used to collect and interpret the data" (p. 275). Reliability in this study was enhanced through the following techniques: by corroborating evidence from multiple sources, checking coding consistency, member checking with the participants and collaboration with the teachers to verify accuracy in interpretations of participants meanings, and the researcher's insider role as a participant observer.

The aspects articulated through this section have been identified as instrumental in enhancing validity (credibility) and reliability (dependability) of the findings particularly in qualitative studies (Miles & Huberman, 1994). It can therefore be concluded that the evidence obtained in this research was credible and dependable to answer the research questions and form plausible basis for its interpretations and conclusions.

3.8 Ethical considerations

From the outset of the current study, the researcher took responsibility to heed to the recommended ethical standards that relate to research involving human participants. As noted by Yin (2009), a researcher should consider ethical plans needed to protect rights and interests of human subjects in a case study. As part of these considerations, ethical approval was sought from the university human ethics committee. After obtaining the ethical approval, the target department was contacted to seek for access to the targeted courses. Upon obtaining

departmental permission, the two targeted teachers were contacted by the researcher to seek informed consent to access their respective course as a participant observer. A clear description of what the research entailed was presented to each teacher in order to achieve shared understanding of the purpose and the scope of the study.

Informed consent was also sought from students who were enrolled in these courses at the outset of online observations. As noted in Johns, Chen, and Hall (2004), despite the ease to access and collect the participants data online as a participant observer, gaining informed consent from the students was paramount to avoid deceit. Moreover, the researcher had interactions with the students (referred to as student participants hereafter) during the survey and interviews, and therefore it was necessary to cultivate positive relationships.

Yin (2009) noted that privacy, anonymity and confidentiality are also important ethical issues to consider in any research involving human subjects. The research participants were assured privacy, anonymity and confidentiality. They were informed of procedures that were to be used to protect their anonymity during the research process and subsequent dissemination of the study findings.

Anonymity was maintained using pseudonyms. The teacher participants were given pseudonyms and informed of pseudonyms chosen for their respective courses. The student participants were also given pseudonyms in this study. To maintain privacy and confidentiality, all research data and related materials were secured by the researcher in which reasonable care was taken during online interactions with the participants, and password-protected storage of the digital data was maintained. Agreeing with Johns et al. (2004), while reasonable precautions were taken, privacy and confidentiality could not be fully guaranteed, particularly because the current study was conducted within online environment where privacy of information over the Internet could not be fully guaranteed. The researcher also shared the data with the participants for accuracy checks and feedback. This enhanced trust and respect of individual rights. It also enhanced dependability and credibility of the research findings. With the researcher as a participant observer, it was possible to establish positive rapport with the participant from the outset of the research process. Miles and Huberman (1994) noted that taking the role of a participant observer is one way the researcher can gain trust and confidence of the participants. Similar ethical procedures were followed in both cases.

3.9 Conclusions

As articulated by Creswell (2008), the research design described in this chapter illustrates a pragmatic paradigm in that this study utilized alternative techniques to answer the research questions. Employing case study methodology that capitalized on understanding the phenomenon in its naturalistic contexts compels the research findings to conceptual and analytic (naturalistic) generalizations (Simons, 2009; Yin, 2009). Through the multiple-case study design, it was possible to establish effects of the intervention in a context and elucidate contextual influences. This implies that, although the multiple-case study design provided an opportunity to enhance transferability of the findings, they may not be obviously transferable to other contexts, thus necessitating analytic generalization, which implies that readers has responsibility to discern what is adaptable or transferable to other contexts.

Detailed description of the specific context of the two case studies, the applied methodological procedures and the findings of each case study are reported in the subsequent chapters.

Chapter 4

4.0 Case 1

4.1 Introduction

This chapter presents Case 1 (a case study of Course 1), one of the two online courses in the current research with a particular focus on how formative assessment was integrated in Course 1; and the meanings that the course participants realized from this. The first part of this chapter provides a description of the case context and the course structure including the course assessment component. This is followed by the specific methodological procedures utilized. Finally, the case findings are presented. The case findings focus on exploring the evidence of formative assessment as part of the embedded assessment guided by the key research question being explored in this study. Theme-based narrative style (Yin, 2009) was chosen to present these case findings in order to form suitable basis for a systematic cross-case analysis. This chapter, in part, has now been published in the peer reviewed, the International Journal on Elearning (Gikandi & Mackey, in press).

4.2 The course background and its context

Course 1 was offered as a partial requirement for award of postgraduate Diploma in ICT Education and/or Masters degree in Education (MEd) programme within a university setting in New Zealand. The minimum entry requirement in this course and other course within the same programme was a bachelor's degree in Education or its equivalent level. Course 1 was offered in the year 2010, and ran for two consecutive academic semesters (one academic year). Each of these semesters had 16 weeks thus 32 weeks in total for this course, including the mid-semester mid-break and other holidays as scheduled in the University calendar; thus the course covered the weeks from February 22nd to October 30 2010. This was a deviation from its previous structure, where it had been offered as two separate courses, each running for a period of one semester. Therefore, this was the first time the course was being offered after being restructured to incorporate the content of two related courses. The course was hosted within the university LMS (Moodle Version 1.9) and all teaching and learning processes were entirely facilitated online where asynchronous mode was the main form of interaction. All the course content and related discourse were archived progressively on the online classroom space.

4.3 Course description

The overall aim of this online course was to expose the learners to subject matter pertaining to learning and teaching within ICT contexts. The course aim was clearly described to the potential students within the University advertising brochure for the postgraduate Diploma. This brochure was published in the University Website and in hard copy. This brochure also described other courses within the programme, including Course 1.

This course will engage the participants in an online community while exploring issues pertinent to learning, teaching, and researching in virtual contexts. Participants will critique research literature related to e-pedagogies, technologies, educational design, institutional strategies and learner support. The course will examine methodologies and strategies for researching in virtual environments, and will equip participants to design their own professional enquiry. (Course 1 description in the University course advertisement brochure to the potential students, Year 2010)

Specifically, this course focused on theoretical and application aspects of e-pedagogies, digital technologies, educational design, organisational strategies and learner support. The course also examined methodologies and strategies utilized in researching educational ICT contexts. Through the various learning and assessment activities, students in Course 1 had opportunities to explore, experience, and develop their own abilities and skills in e-learning and e-teaching.

The key goal in this course was to support educational professionals to actively develop deep understandings of content through engaging in authentic learning activities within a supportive learning community; and in turn support them to connect their learning to real-life professional practices and contexts. The course was designed to engage the students with content and enable them to achieve the expected learning outcomes with respect to the relevant ICT-related knowledge and skills. In particular, the teacher in designing Course 1 aimed to facilitate a learning environment that would support students to engage meaningfully with others and become primarily responsible for their learning. In turn, the teacher expected that this would enable students to develop rich understanding of relevant theories, current research and various aspects of e-learning applications in face-to-face, blended, and online contexts.

Figure 4.1 shows the home page of Course 1 which provides an overview of the course within Moodle environment as the LMS. It contains teacher's welcome note and links to the key sections of the course including course overview, topical sections, resources, assessment information, and discussion forums.

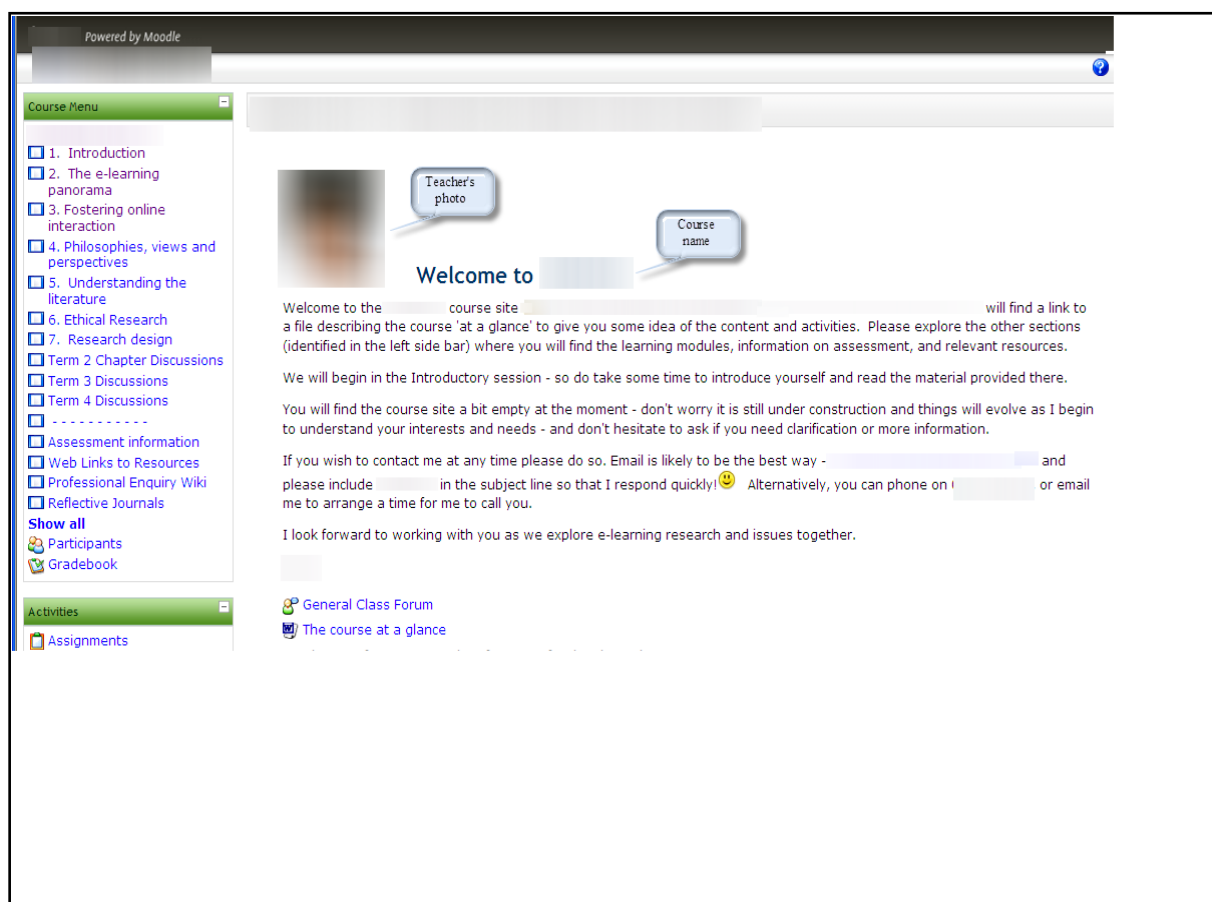


Figure 4.1: Home page of Course 1 titled '[Course 1]: Teaching meets technology in online environments' (screenshot captured on 26 October 2010)

As it will emerge within the findings presented in Section 4.5, this course was designed and taught by one teacher with very little support or intervention from the University e-learning advisors and designers. This was not typical in this university because most of the educators sought support from the e-learning advisors in designing their online or blended courses. The teacher in this course (identified as Teacher A in this study) had enormous experience and skills in teaching online which she had developed over a period of ten years, so had no need to call on such expertise. This aspect of teacher's experience in online pedagogy and research will be detailed further in latter sections (e.g. Sections 4.4.1).

4.3.1 Course structure

The teacher had structured the course into thematic sections (based on the targeted outcomes) that were categorized into four phases in this study. They were:

1. Climate setting as the first section that was labelled 'Introduction'
2. Illuminating students existing knowledge, experiences and interests in relation to the course goals, which was section 2 in the course LMS 'The e-learning panorama',

3. Fostering and modelling a focused and an interactive learning environment which was section 3 in the course titled ‘fostering online interactions’
4. The learning sections that were related to the main course content. All the course learning sections had a corresponding topical discussion forum(s) in order to facilitate shared understanding of content through interactive discussions.
5. Focus on authentic project and sharing of artefacts: In the final section of the course, the students had more time to focus on their preliminary investigation project and its presentation (the ‘A4’ artefact showcasing) for both formative and summative assessment purposes. This will emerge in details within the case findings.

Within the first section the ‘Introduction’, all students were expected to undertake an introductory activity that required them as course participants to present their biography with aspects relating to demographic data with an option to conceal what they were not comfortable sharing within their online classroom. Here is sample introduction excerpt from Student F: “Hi Everyone, Great to read your introductions! I'm really excited about this course and working with you! I am originally from England (near Liverpool) but have lived and taught in Christchurch since 2004. I live in...” (Student F, ‘Introductions Forum’ in online discussion forum, 24 February 2010).

The teacher had dedicated the first week to introductions and familiarizing with the course site to provide the students with opportunities to know each other and acclimatize to the online environment. This provided foundation for building trust and positive social relationships that in turn would foster meaningful interactions among the participants (learners and the teacher) of this online course community. At the outset of this introduction activity the teacher provided a rationale for this activity, a document with guidelines on how to explore the course site, and a link to the specific course goals.

In the second section, ‘The e-learning panorama’, students were guided to share their existing understandings and experiences, views and interests in relation to the overall goals of the course. As part of this activity, students were also required to reflect and post entries in their online reflective journals about their own understanding of key concepts related to e-learning and teaching. In explaining rationale for this activity, Teacher A wrote:

This course will largely evolve from your interests and needs. My challenge is to understand where each of you is coming from and to help shape the learning experiences and guide course activities in response to your needs. You will also need to take responsibility for your own learning and be proactive in creating the course content with me as we progress (Teacher A, section 2 guidelines in the course LMS, February 2010)

The teacher's aim was to provide an opportunity for students to articulate their prior knowledge, experiences, interests and perceptions. In turn, this provided some information about students' specific situations, interests and expectations in relation to the course goals. This approach of encouraging the students to articulate their prior knowledge provided them with opportunities to make their tacit knowledge explicit and unmask their learning styles, needs, interests, personal experiences and context. As it will merge in details in the findings, this in turn supported the teacher and peers to facilitate personalized and contextualized learning environment.

The third section, 'Fostering online interactions', involved the teacher in facilitating and modelling ways to promote meaningful online interactions. The teacher expected that this would help the students develop online facilitation skills that they needed to apply within their class discussions. The facilitation task as it will be described in the following sub-section and later illustrated in the findings was part of assessment for both formative and summative purposes.

The remaining course sections were designed to generate relevant course content and opportunities for knowledge building. The dominant pedagogical strategy within these sections was collaborative learning which was evident from the various learning forums with threaded discussions emerging from course participants' contributions within these sections. Figure 4.2 is an example of such a learning discussion forum within the course that was designed by the teacher and facilitated by Student A through the seventh week of the course. Of the 21 threads in this forum, each student initiated at least one thread while Student A initiated 9 threads as the forum facilitator. Aspects within these discussion forums will be explored later in the findings section.

Powered by Moodle

Forums > Chapter 4 The design of learning technologies (26-30 April) Facilitated by Student A

This forum allows everyone to choose Everyone can

Student A

The chapter focuses on the nature of e-learning approaches and supporting technologies (see p. 55) and is primarily concerned with designing for learning and not content transmission. The discussion addresses clusters of technologies and their impact on learning, including: multimedia, hypermedia, simulation and games; virtual reality, virtualisation and virtual labs; communication tools, adaptivity and personalisation; mobile learning; and ubiquitous computing.

Add a new discussion topic

Discussion	Started by	Replies
Wrap up		0
Brief reflection and wrap up of chapter 4		2
Does this look familiar?		3
Professional development in e-learning for tertiary educators		1
What forms of learning technology do learners prefer?		1
Are technological developments driving learning strategies?		5
Does the type/maturity of technology have an influence?		6
Interesting		6
Last task: PMI (Positive)		6
Minus		8
'Watercooler' Chat - but too cool not to share...		2
Extent to which technological developments are driving learning strategies		32
Modalities and Channels		7
Welcome back		5
Whoops almost forgot! PMI's due by Friday evening please		0

Each student initiated at least one thread in this forum; Student A as a facilitator initiated 9 of the 21 threads, and the teacher was a co-participant

Figure 4.2: An example of learning discussion forum: 'The design of learning technologies (26-30 April facilitated by student A' with the last thread appearing at the top (screenshot captured on 26 October 2010)

Additionally, the teacher had designed for embedded assessment in this course, that is, the assessment was ongoing and seamlessly integrated within teaching and learning processes in ways that served both formative and summative purposes. Therefore, the processes and products that resulted from students' engagement in a variety of ongoing learning and assessment activities formed the basis for overlap and interweave between formative and summative assessment.

4.3.2 Summative assessments as part of the embedded assessment

The summative assessment in this course was ongoing and was based on activities that aligned with the course goals and expected outcomes. The summative assessment was structured within four activities namely: A1 –participation, A2 – professional enquiry, A3 –

preliminary investigation project, and A4 –research proposal presentation. Students’ performance in each of these activities was graded for summative purposes with respective contribution of 25, 25, 35 and 15% of the overall summative assessment requirements (final grade obtained for this course). These activities were distributed throughout the course duration and were interweaving such that one assessment activity was expected to inform latter one(s). The participation activity ran through the first 12 weeks of the course and it informed all the other three activities. The professional enquiry activity (A2) overlapped with the participation activity. The preliminary investigation project (A3) started after the middle of the course period and built further into the research proposal presentation (A4) towards the end of course.

Figure 4.3 shows a screenshot of the course assessment information as provided by the teacher at the outset of the course. This entailed the description of the four assessment activities and their corresponding guidelines and rubrics. The teacher provided all the assessment information at the outset of the course including clear assessment guidelines and analytical rubrics for each activity that were the basis for awarding the grade. The rubrics for each of the four assessments are provided in appendix 3.A. The rubrics were revised along the course based on identified needs that emerged through shared understanding among the course participants. The excerpt below is an example of such an instance where the teacher was providing further guidance to the students in regard to how they could approach the assessment activity A4:

Develop a draft research proposal (as originally outlined in A4). The option is suitable for people who have already identified a research problem and who are keen to develop their understanding of research design as a key outcome of this course. (It would be particularly suitable for people who have already completed a research methods course.) If selecting this option you would need to... (Revised assessment guidelines as posted by Teacher A, July 7, 2010)

This excerpt is from one of the documents depicted in Figure 4.3, labelled: ‘A3 and A4 Revised Guidelines and Rubrics’. As it will be explored later in this chapter, the teacher had designed for various opportunities for shared meaning of the assessment information.

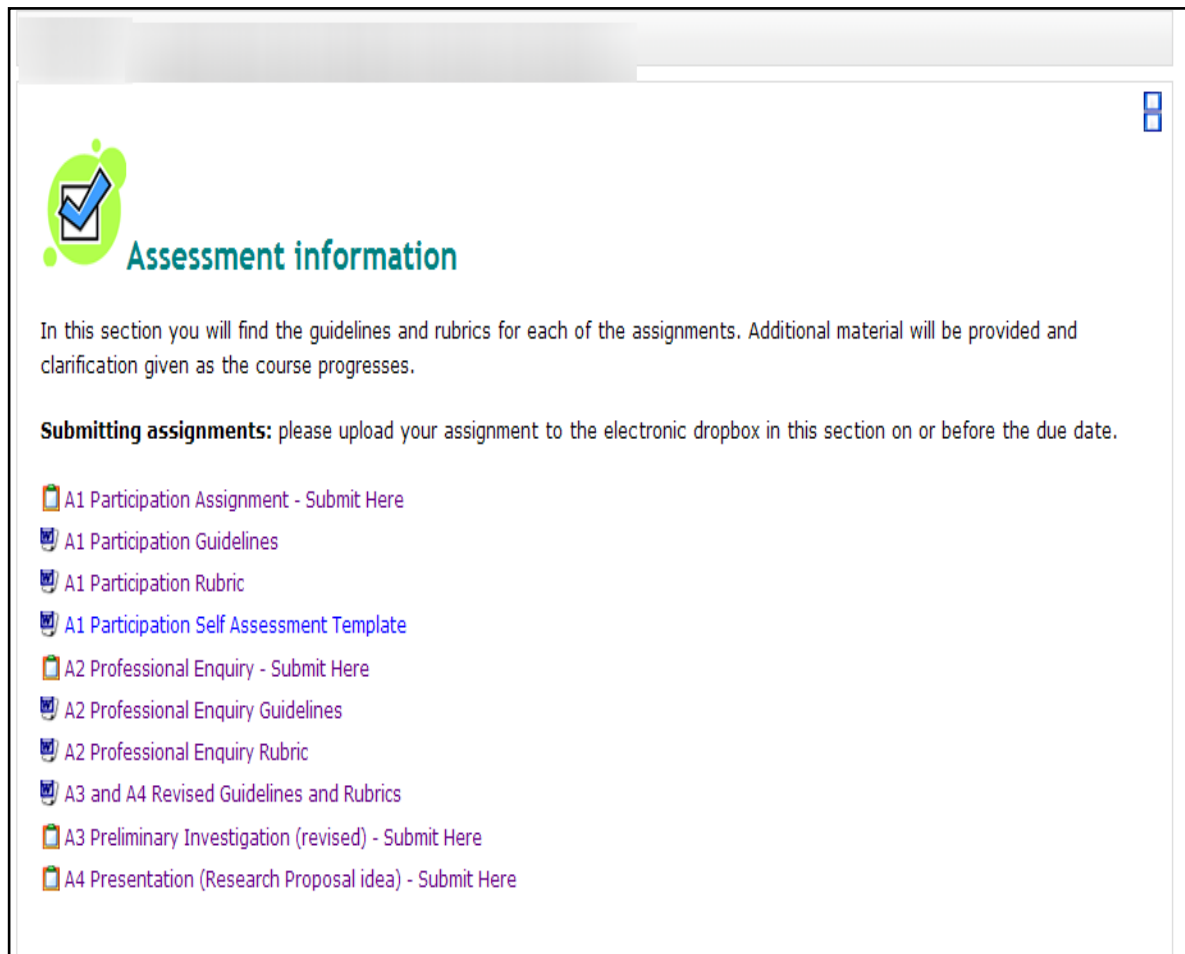


Figure 4.3: Assessment information section in the course LMS for the four summative assessments, including a link to the electronic drop box for submission, guidance and the most up to date assessment rubric for each assessment (screenshot captured on 26 October 2010)

The key information for the four summative assessments as designed by the teacher is summarized in Table 4.1. As can be seen in Table 4.1 and will emerge in more details within the findings, the teacher had purposefully embedded these four ongoing summative assessments and related activities as part of the course design to facilitate meaningful learning and ongoing formative assessment. These ongoing summative assessments; and the interweaved formative assessment activities plus related processes provided opportunities for ongoing monitoring, assessment of evidence of learning and formative feedback. An example of such formative activity and related processes was the reflective journal writing by individual students that provided opportunities for ongoing monitoring and formative feedback by self and others (teacher and peers). The teacher had designed an online reflective journal for each student that was open to the entire class. These formative assessment activities and processes are further described and illustrated in the findings presented in section 4.5 and further analyzed in Chapter 6.

Table 4.1: Summary of key information for the four summative assessments in Course 1

The summative assessment activity	Description of what the students were expected to do for summative assessments	Official start date and the due date of completion or submission
A1: participation	<ul style="list-style-type: none"> Active participation and interactive collaboration with peers within asynchronous online discussions in the course LMS. The participation of individual students was assessed using the Participation rubric in Appendix 3.A.1. 	22nd February through 20 th June 2010
A2: professional enquiry	<ul style="list-style-type: none"> Identify and explore a particular issue, aspect or dilemma of e-teaching and learning that related to individual practice, situation and/or interests. This activity involved exploring technologies related to e-teaching and e-learning from the perspective of real-world applications and situations. It also included identification and analysis of the related literature. 	The professional enquiry activity overlapped with the participation activity. Started February 22nd and was due date 4 th June 2010
A3: preliminary investigation project	<ul style="list-style-type: none"> This was an open-ended project in which the students identified and carried out an authentic investigation. Students were assessed based on the rubrics that the teacher had provided as shown in Figure 4.3 guidelines labelled 'A3 and A4 Revised Guidelines and Rubrics'. 	Started 6 th August and was due on 11 th October 2010
A4: research proposal presentation	<ul style="list-style-type: none"> The students were expected to create a presentation based on their assignment A3 outcome using presentation media of their choice. The presentation was supposed to be accessible to others (teacher and students) in their online classroom. To review peers' artefacts and provide formative feedback to at least to two of their peers. 	Start date 6 th August and was due on 25 th October.

Guided by the key the research question, the researcher carried out an in-depth investigation on how formative assessment as part of the embedded assessment occurred and its impact on students' learning experiences. The following section focuses on the specific methodological procedures that were utilized in this case study before the findings are presented.

4.4. Methodology

The researcher applied the methodological procedures described in Chapter 3 in conducting this case study. The specific methodological procedures are described in the following sub-sections.

4.4.1 Research participants

There were 13 participants in this course (11 students, 1 teacher and one participant observer/researcher), and all course participants volunteered although to varying degrees as described in Section 4.4.2.

The students were continuing graduate professionals who had previous academic background with at least a bachelor's degree and were practicing teachers and/or working in other education sectors. Table 4.2 presents an overview of Case 1 participants. The students participants differed in gender, age which varied between 31 and over 50 years, work experience which varied between 2 and over 15 years. For the purposes of this study in order to ensure participants anonymity, the participating students were identified as Student A...H. As shown in Table 4.2, student participants who were engaged in teaching in their respective institutions did so at either junior or senior primary, secondary or tertiary levels. In total, 5 student participants were involved directly in teaching with 2 others holding administrative positions in their respective institutions, while 1 participant held a position of a research consultant.

Table 4.2: Overview of Case 1 student participants and their demographic information

Participants	Gender	Age	Country	Educational sector	Experience	Role	Courses taken	Load
A	female	> 50	NZ	secondary	> 15	Teacher: languages, mathematics	None but taking other three online courses concurrently	Full-time study (on study leave)
B	female	31-40	NZ	senior primary	11-15	Administrative role and teaching all (supposed to teach any of subjects offered at that level) than three	2 and taking other two courses concurrently	Full-time (on study leave)
C	male	31-40	Outside NZ	tertiary	2-5	Teacher: ICT applications, ICT and pedagogy, teaching skills	1	Full-time study (on study leave)
D	male	> 50	NZ	tertiary	> 15	online learning advisor	none	Part-time study; Full-time work
E	female	> 50	NZ	tertiary	2-5	Teacher: academic skills	none	Part-time study; Full-time work
F	female	41-50	NZ	primary	> 15	Administrative and consultant role	1	Part-time study Full-time work
G	female	31-40	NZ	tertiary	2-5	Research consultant	none	Part-time study; Full-time work
H	male	31-40	NZ	junior primary	11-15	Teacher: languages, mathematics, sciences	3	Part-time study Full-time work

Notes:

Participants: Student A...n ($N=8$); **Gender:** Either male or female; **Age:** Range in years; **Country:** Country in which participants currently practice; **Educational sector:** Education sector or level they work in which could be junior, primary, senior primary or tertiary; **Experience:** Years of teaching experience (current and previous); **Role:** Current role and/or main teaching subjects; **Courses taken:** Previous online courses taken before course A; **Load:** Study mode

The teacher was considered a ‘key participant and informant’ (Yin, 2009, p. 107) in this study as defined earlier in Chapter 3. While paying attention to students’ consent to be observed within their online classroom, the teacher’s consent to access her course in the role of participant observer was also crucial. The teacher also granted permission on use of her course input. This was in addition to responding to interviews at the start and end of the course (initial and end-of-course interviews). As noted earlier the teacher had long-term experience in teaching online. She had designed and taught various online courses for a

period of ten years within the field of professional development and ICT in education for teachers during which she has utilized various LMS including Blackboard, StudentNet and Moodle based on the institutional needs and technological advancements. Notably, the teacher has also been researching her online courses and has long-term experience as an educator in professional development for teachers in schools and tertiary sector

...around year 2000, I was invited to teach graduate diploma in education and those course by that time were supposed to be fully taught online in the College of Education; they were in the school of professional development. So these were courses targeted for teachers in schools, they were graduate and postgraduate courses and they were taught online from around 2000. Originally they had been a combination of paper-based distance course and residential courses. Then there were trials with some people including myself, [Teacher B] and other staff members teaching online courses using Blackboard for a short period I think one semester. Then around the same time one staff member working in the library began development of the StudentNet. So we were very lucky to be the first people we were going to be trialling during that time of initial e-learning developments and being among leaders in online learning in New Zealand... (initial interview with Teacher A)

As describe in Chapter 3 (Section 3.6.3), the researcher was a participant in the role of ‘participant observer’ throughout the course period with limited participation to avoid being an interruption to the setting.

4.4.2 Data gathered in Case 1 and its analysis

All the 11 students enrolled in this online course agreed to participate during the data gathering process but in varying degrees, as follows: (a) The entire class was observed throughout the course duration, (b) eight responded to the end-of-course survey, (c) eight consented to the use of their contributions within the asynchronous discourse for research purposes, and (d) seven students participated in the end-of-course interview. Table 4.3 presents an overview of the 8 key student participants (those who consented beyond classroom observations). The Table presents a summary of data obtained from multiple sources in case 1 through involvement of the 8 key student participants.

As shown in Table 4.3, the 8 student participants consented to the use of their data within the four sub-components of the archived course discourse. In addition, course data was also obtained from the teacher’s input into the course including her contributions within the online course discourse as either feedback to the students or as a co-participant within the discussion forum. The term discourse as used in this study highlights the purposeful and sustained deliberations within learning and assessment processes in this online course. The data gathered from various sources was analyzed and subsequently triangulated to corroborate the evidence based on the methodological procedures previously described (see Section 3.6).

Table 4.3: Summary of student participants' involvement and data obtained in Case 1

Participants	Online reflective journals	Learning content within discussion forums	Other forums	End of course interview
A	+	+	+	1
B	+	+	+	1
C	+	+	+	1
D	-	+	-	1
E	+	+	+	1
F	+	+	+	-
G	+	+	+	1
H	+	+	+	1

Notes:

Participants: Student A...n ($N=8$); A*, B*, G*: participants in both cases; **Other forums:** Forum for sharing assessment related issues, and A4 presentations and peer feedback forum; +: available; -: not available; **End of course interview** – recorded for duration ranging 45 minutes to 1 hour; ¹carried out at

The initial themes emerging from the analysis of data from the various sources (the four key sub-components of the archived course discourse and the interview transcripts) revealed evidence of ongoing formative assessment. The four sub-components of the course discourse included students' reflective journals, the online discussion forums, forum for sharing assessment related issues, and presentations and peer-peer feedback forum. These initial themes were examined for relationships, pattern coded into broader sub-themes and then aggregated with respect to the four broader (major) themes based on the four identified elements of formative assessment: (a) assessment structure, (b) nature of the assessment activities, (c) shared understanding of learning goals, content and expected outcomes, and (d) ongoing monitoring, assessment and formative feedback. These four major themes were derived from the guiding criteria depicted in Table 3.1. Subsequently, the broader themes that emerged from the different data sources were triangulated to discern converging and diverging evidence. Convergences were interpreted as confirmation while diverging evidence formed the basis for revisiting the raw data sets to seek for further explanations (Yin, 2009, pp. 114-118), and therefore the data analysis was a back and forth process. The mapping of the initial themes into the broader sub-themes was overlapping due to the inherent relationships between these themes and therefore their further structuring onto the four major themes was not exclusive.

The initial themes emerging from the various data sources reveal that most of the identified themes were replicated in various data sources. However, these themes emerged from varying scenarios. For instance, peer formative feedback within the participants' online reflective journals emerged as each student publicly articulated their developing ideas and progress in accomplishing the assessment tasks and when peers responded with constructive ideas. Within the online discussion forums, peer formative feedback was also evident as the

students articulated their thinking which peers responded to with converging or divergent viewpoint on topical content.

Tables 4.4 and 4.5 provide an overview of the emerging themes and illustrate some commonality among the initial themes identified through coding of data from the reflective journals and discussion forums respectively. In both tables, themes are arranged to indicate theme dominance, starting with the highest number of instances. However, these themes did not emerge in any given order during the coding process, they emerged randomly and instances cumulated over time. Table 4.4 shows the themes emerging from the participants' online reflective journal while Table 4.5 presents those emerging from online discussion forums and their respective cumulative frequency.

Table 4.4: Outline of the emerging themes from the participants' online reflective journals arranged in descending order with respect to the number of instances coded

Theme ID	Name of the theme	Number of instances coded
1	Recognition of the class as a learning community	37
2	Peer formative feedback as constructive responses from peers upon one's idea/work	28
3	Sharing (or debriefing) of individual learning experiences within the online discourse and connecting how this is influencing their progress in accomplishment of the assessment tasks	27
4	Awareness and articulating about developing ideas, understanding and abilities	24
5	Students sharing their developing ideas and progress in regard to accomplishment of the assessment tasks	24
6	Connecting own thinking or ideas to the literature	21
7	Teacher formative feedback as informative responses to students question and/or teacher's feedback prompted by her monitoring the student's progress and achievement	21
8	Recognition of peers feedback or support (feedback on feedback)	19
9	Connecting ideas to broader and relevant real-life contexts, issues and practices	17
10	Teacher follow ups on student's progress and offering support outside the online classroom space	13
11	Connecting ideas to own professional context and practices	12
12	Affective gestures and casual social dialogue	11
13	Reference to previous contributions by others or self	11
14	Recognition of teacher feedback	10
15	Self awareness and recognition of own strengths and weaknesses (learning style and learning needs) as an online learner	10
16	Stimulated to try or explore new possibilities or ICT tools - discovering new tools or how to use them as they engage within the discourse and interact with the class members	10
17	Direct question to the teacher or directing requesting teacher feedback or support	9
18	Student feedback to the teacher updating her on their progress in regard to accomplishment of the assessment activities	9
19	Awareness and setting own learning goals and strategies - self regulation	8
20	Connecting across the curriculum	8
21	Foregrounding and articulation of individual previous understandings, skills, and	7

Theme ID	Name of the theme	Number of instances coded
	experiences	
22	Directly prompting feedback from others (class members)	6
23	Individuals sharing their personal experiences (learning or professional contexts and using own metaphors)	6
24	Teacher fostering and encouraging students to achieve more meaningful (that can build into a bigger valuable whole) artefacts (assessment activities products and processes)	6
25	Seeing the building of a bigger picture from a variety of assessment activities - students able to connect how the assessment activities maps onto each other	4
26	Teacher ongoing monitoring, encouragement and fostering of shared purpose of assessment activities	4
27	Teacher recognition of peer-peer feedback	4
28	Appreciation or compliments for feedback or support received from others	3
29	Ongoing reviewing and flexibility of rubrics as need arises	3
30	Valuing one's or others work on assessment task (student-created artefacts) as something that can build into a bigger whole	3
31	Appreciation of analytical rubrics (clear and adequately detailed)	1
32	Clarity for one's previous actions and or responses to avoid misconceptions or misunderstandings	1
33	Teacher recognition of students' exemplary ideas and work	1
Total number of instances coded for all the themes		378

Notes: (a) see detailed description of the themes in Appendix 3.B, (b) These initial themes were overlapping due to the inherent relationships between them and therefore their further categorization and relevant examples are structured within four major themes in Section 4.5.

It is notable that the identified themes were similar and/or related between the two data sources, particularly based on the major themes of interest to this research. However, there were more initial themes emerging from the discussion forums compared to reflective journals. A total of 33 themes emerged from participants' reflective journals compared to 44 from online discussion forums.

Table 4.5: Outline of the emerging themes (the 30 most coded) from the online discussion forums arranged in descending order with respect to the number of instances coded

Theme ID	Name of the theme	Number of instances coded
1	Peer formative feedback	220
2	Connecting ideas to the relevant literature (in relation to the course content)	116
3	Connecting ideas to broader real-life contexts, issues and practices	109
4	Connecting ideas to own work contexts, experiences and practices	86
51	Sharing individual views and understanding of content - initiating or extending a discussion thread within the class forum -learners as thread starters or extenders	70
6	Recognition of the class as a learning community	63
7	Sharing (debriefing) of individual learning experiences with in the course or connecting ideas to the online discourse	56
8	Awareness and debriefing of one's progress or current way of thinking and understandings of content and developing abilities	54
9	Recognition of self as a source of learning support or feedback	54
10	Recognition of feedback or support from peers	52
11	Reference to previous contributions (by self or others) within the discussions	41
12	Affective gestures	35
13	Sharing personal background, interests, learning goals, expectations from the course and previous professional experiences	28
14	Teacher as a co-participant in the discussion forums	26
15	Appreciation or complimenting on peers' work or ideas	22
16	Self awareness of own learning needs and style as an online learner	21
17	Sharing own professional background, learning needs and interests and foregrounding current understandings in relation to choosing and refining ideas on a focus for assessment activities	17
18	Identifying relevance of others questions and, or ideas to own assessment work or relating ideas from one assignment to another	16
19	Recognition of teacher feedback	15
20	Teacher scaffolding, guidelines, modelling and fostering shared purpose of an activity	14
21	Directly asking peer a question or prompting support from peers	13
22	Teacher recognition and fostering the view of the class as a supportive learning community - seeing learners as a learning support for others in the class	13
23	Identifying and connecting with common ideas and interests among peers	11
24	Appreciation of support from others	10
25	Connecting across the curriculum	10
26	Self-awareness of own beliefs or perceptions and recognition of changing perceptions	10
27	Students sharing their developing ideas about assessment tasks	9
28	Teacher feedback	9
29	Teacher recognition of peer-peer feedback	9
30	Teacher recognition of the diversity of learners' background and experiences	9
Total number of instances coded for all the themes		1218

Notes: These initial themes were overlapping due to the inherent relationships between them and therefore their further categorization and relevant examples are structured within four major themes in Section 4.5.

Figure 4.4 was obtained from information presented in Table 4.4 by plotting the number of instances coded for a particular theme as a percentage of total number of instances identified for all the 33 themes. The number of instances coded as shown in both tables manifests the dominance of a particular theme within the selected content from the students' online reflective journals. For instance, peer formative feedback was the most coded theme as represented by the total of two closely related sub-themes: peer formative feedback and recognition of peer feedback (Theme ID 2 and 8 respectively, Table 4.4) with 12.4% (47 instances out of a total of 378 identified instances for all the themes). It was followed by recognition of the class as a learning community (Theme ID 1, Table 4.4) with 9.8% (37 instances).

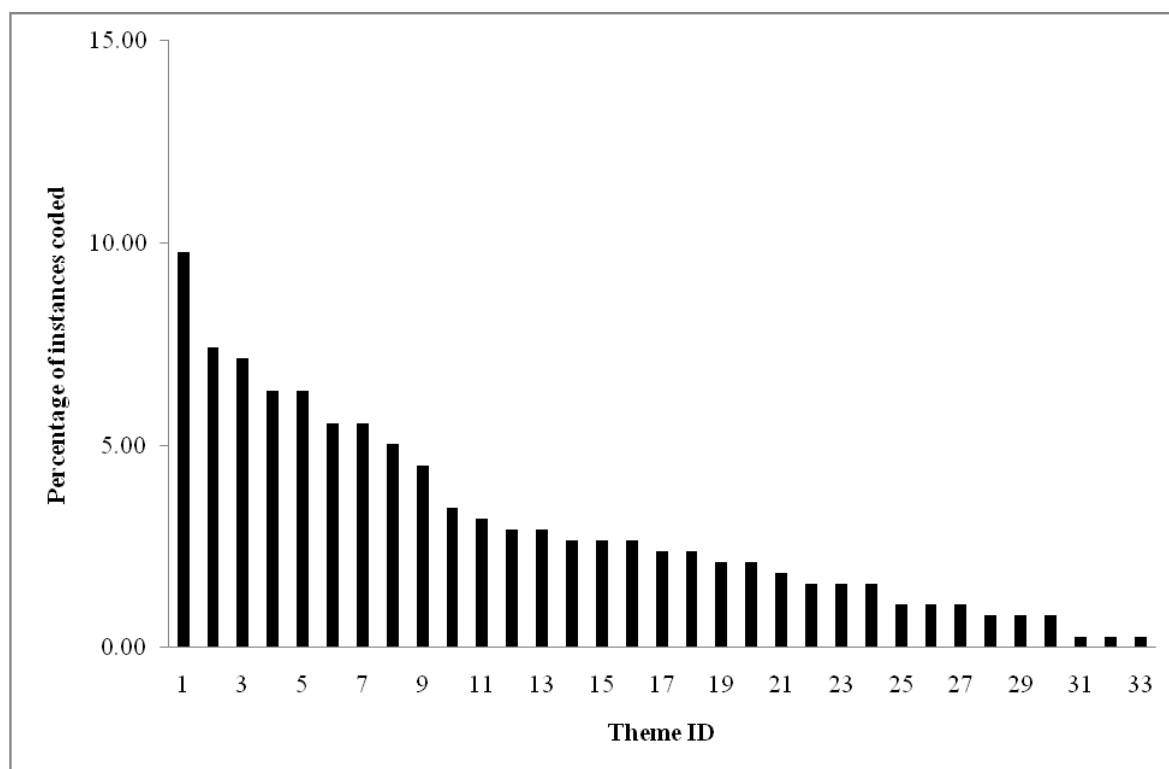


Figure 4.4: Initial themes identified from students' online reflective journals, derived from Table 4.4

Similarly, Figure 4.5 below was obtained from information presented in Table 4.5. It is evident that peer formative feedback was the most coded theme as represented by the total of two related sub-themes: peer formative feedback and recognition of per feedback (Theme ID 1 and 10 respectively, Table 4.5) with 22.2% (272 instances out of a total of 1218 identified instances for the 30 themes). It was followed by connecting ideas to the relevant literature (in relation to the course content) (Theme ID 2, Table 4.5) with 9.5% (116 instances).

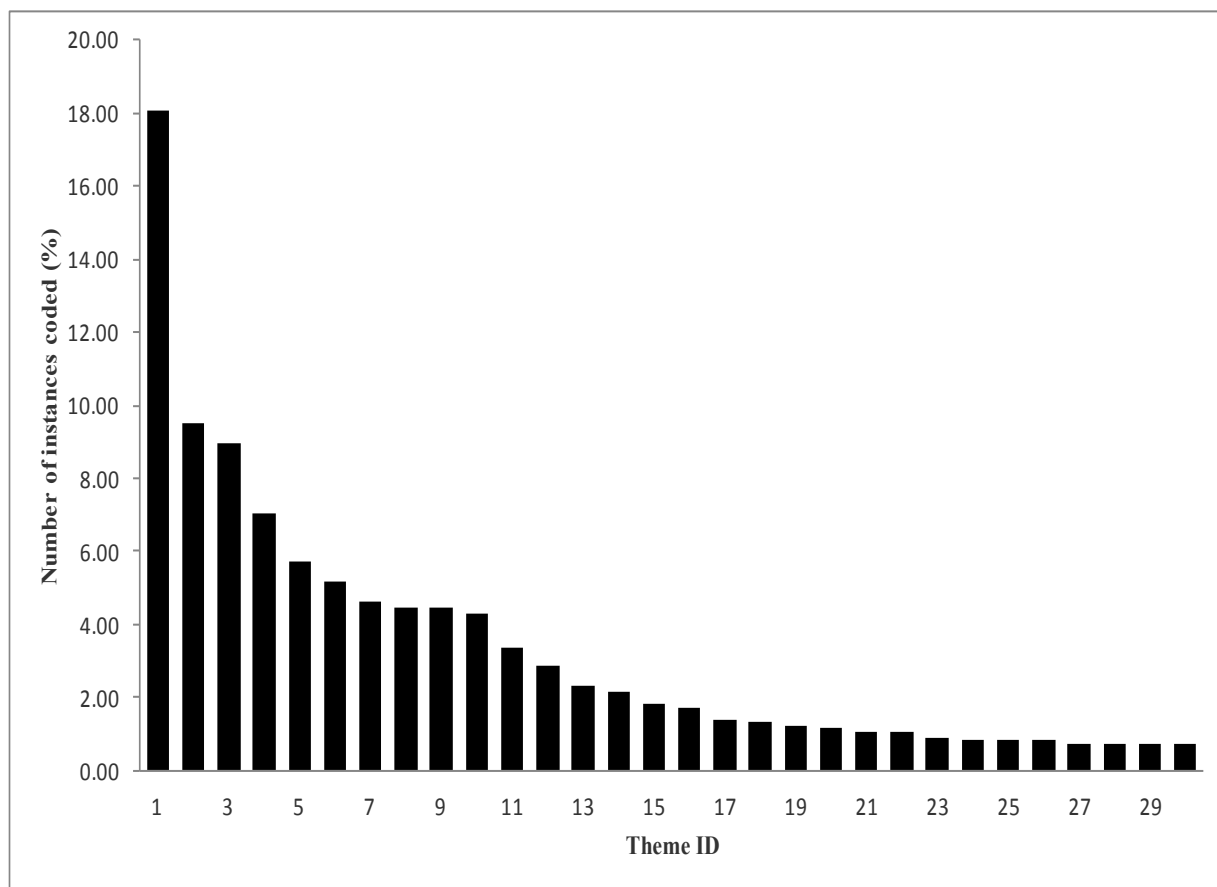


Figure 4.5: The most 30 coded themes from the online discussion forums, derived from Table 4.5

4.5 The findings of Case 1

This section provides detailed findings in which the themes that emerged from the coded data (from all sources) are structured around four major themes: (a) assessment structure, (b) nature of the assessment activities, (c) shared understanding of learning goals, content and expected outcomes, and (d) ongoing monitoring, assessment and formative feedback. The first theme was the assessment structure which formed the foundation and supported other formative aspects. This theme included two key aspects: a variety of ongoing and interweaved assessment activities both for formative and summative purposes, and ongoing documentation and openness of learning and assessment processes and products. The second theme was related to nature of assessment activities which included the authentic nature of the assessment activities and learner autonomy. These aspects created opportunities for contextualized learning where knowledge was generated through authentic activities that facilitated meaningful learning processes (experiences) thus supporting the students to connect their learning to their previous knowledge, and real-life professional contexts. The

learner autonomy was a key aspect in enhancing authenticity and contextualized learning by allowing students to engage with activities that served their learning goals and interests. The third theme was related to the ongoing opportunities for shared understanding of learning goals, content and expected outcomes. These three themes were pre-cursor to the fourth theme of ongoing monitoring, assessment and formative feedback within which responsibilities were shared among the individual learner, peers and the teacher. These four themes were used to structure the case study findings in the following sub-sections. The findings with respect to these themes and their related sub-themes are presented in a logical order.

4.5.1 Ongoing assessment structure

This theme explores the evidence emerging from the gathered data with respect to the assessment structure which describes the teacher's approach to assessment in this course. As noted earlier, the assessment in this course was ongoing and entailed variety of assessment activities that were embedded into teaching and learning processes for both formative and summative purposes. The teacher had structured the assessment activities in such a way that they facilitated ongoing assessment of the expected learning outcomes as indicated in the assessment guidelines and rubrics. The teacher scaffolded learning through these ongoing assessment activities in that the current students' performances informed her next online facilitation and support to the students. Another key aspect of the assessment structure was the teacher's intentional utilization of the affordances of the LMS to provide opportunities for ongoing archiving (documentation) and sharing (publicity or openness) of learning and assessment processes and products including work in progress (student-created artefacts as evidence of learning resulting from students' engagement with a variety of learning and assessment activities).

During the initial interview with the teacher, she acknowledged the value of formative assessment as a strategy for promoting meaningful online learning and its ongoing assessment. Although she didn't necessarily use the label 'formative assessment', she explained why she incorporated formative assessment in her pedagogical practice which revealed how her pedagogical philosophy (beliefs and dispositions) had influenced her approach to teaching, learning and assessment with respect to active students' involvement in these processes within a supportive learning community:

I don't necessarily use the label formative assessment but I recognize the value of the formative aspects and use them as part of my normal teaching practices. I would say one thing I have always valued is about creating an online learning community so that it is not about me giving a lot of content but it is about creating space for students to actually come in a virtual way to think this as their virtual classroom...courses that I have taught online have been very

much structured around coming together to do things together: to discuss things, get feedback or do other peer activities...the content itself is being developed by the students as we go along. I don't have set content, but I know what the learning outcomes are for the students but the content is really being generated depending on what their students' needs and interests are (initial interview with Teacher A, March 2010)

The online observations showed that the four ongoing assessment activities followed each other in a logical sequence that was consistent with the flow of the course content and learning goals. That is, they mapped on to each other and this supported students in using the current activity to inform the next one. In particular, the participation activity informed all the other three assessment activities and supported students to identify a focus for A2 activity which would provide a foundation for the A3, and then A4 was based on the A3. The teacher was explicit in guiding students to identify a focus that would enable them to capture interconnected elements that fitted with the requirements for these assessment activities. For example, Teacher A posted this as guidance to Student E in her reflective journal:

You may also like to read the A2 Guidelines and to think about whether the issue you have identified in this discussion would be suitable to develop as your main focus for the course (through the three assignments A2, A3 and A4)... (Teacher A guidance within Student E online reflective journal, 1 April 2010)

The analysis of the archived course discourse further revealed that the students recognized this and were able to identify a focus that enabled them to constructively link these assessment activities. For instance, Student G had posted this in her reflective journal:

I have been trying to narrow down a focus for both A3 and A4 with the aim of linking them as closely as possible and using A2 as a start so as not to waste the effort put in there!...A3 would then take the form of an in depth literature review in this area including more of a focus on the methodologies used in studies in this area to inform A4. A4 would be a proposal to investigate the effects of different types of communication on learning and perspectives in a science classroom (Student G, online reflective journal, 7 July 2010)

All the 7 interviewed students provide evidence that they valued the interrelatedness among the assessment activities. For instance, one of the students noted: "...I think the assignments build onto each other so one assignment helped me with the next one and so forth, and so that was helpful" (interview with Student H, November 2010). As revealed through online observations and analysis of the archived course discourse, the interrelations among the assessment activities progressively developed into a more meaningful whole or useful outcome. This was also noted by 4 of the 7 interviewed students as they explicitly articulated how they felt that their assessment products could become valuable beyond the course. This was also recognized by the students within the online discourse as they showcased their individually-created artefacts (outcomes from student assessment work – both processes and products including work in progress). For example, Student C posted this online: "Here I have attached my A4 presentation. I would appreciate your comments and

critiques on it, so that I can re-tune it for my real thesis purpose” (Student C research proposal, ‘A4 Showcase Forum’ in A4 presentations and peer-peer feedback forum, 20 October 2010).

Table 4.6 provides a summary of the specific focus of the authentic projects that 7 of the 8 student participants engaged in and showcased for their ‘A4’ summative assessment using a presentation media of their choice.

Table 4.6: Summary of students’ artefacts from the authentic project on ‘Preliminary investigation project’ as showcased for summative assessment within the ‘A4 showcase Forum’ in Course 1

Student participant	Specific focus of their project	Presentation media
A	How can mobile technologies be used as learning tools?	Prezi.com
B	Do NZ primary teachers know what e-learning expectations as written in Ministry of Education (MoE) documents are applicable for them to apply in their own teaching?	Prezi.com
C	Understanding Teacher Educators’ Perspectives of ICT Education: What are teacher educators experiences and understanding of implementing – ‘the Teaching ICT in Education curriculum in the B.Ed. program in Bangladesh’	MS PowerPoint
E	Dyslexia and collaborative new knowledge construction: a five step process using concept mapping software integrated with instructional design	PresenterMedia.com
F	Why aren’t elearning strategies transforming our classroom practice?	MS PowerPoint
G	Can blogging support teaching of the nature of science and connect students with real science?	Prezi.com
H	Adolescent information disclosure on Facebook: An exploration of young adolescents’ information privacy practices and attitudes	Prezi.com

Note: Student D did not undertake this activity as he had already withdrawn from the course by this time due to his work-related commitment.

As illustrated further in the Section 4.5.2, the learner autonomy enabled students to engage in authentic projects that fitted their learning goals and professional work context. As illustrated in Section 4.5.4, the student also received formative feedback on their artefacts within this showcase forum. The teacher was keen to provide ongoing guidance to students in structuring their assessment tasks in a way they would engage in meaningful process and enable them to accomplish valuable outcomes.

...Your A3 assignment could well be to develop an instrument to help you understand student voice in relation to an aspect of e-learning...A4 could then relate to the ethical approval process to conduct the survey (You would be well on the way to being able to apply for ethical consent to use it in a research project or your thesis!)... (Teacher A feedback in Student B online reflective journal, 26 June 2010)

Interviews with the students at the end of the course confirmed that they all benefited and valued this ongoing assessment structure. They had diverse but positive perceptions about how ongoing assessment served as framework for their learning scaffold, and supported them

to monitor and assess their progress in their pursuit to achieve the expected outcomes. For instance, one student expressed:

The variety of assessment activities gave us an opportunity to pick and put more effort in areas one felt was strong at and improve your grade by doing your best in these areas. The ongoing assessment activities also enabled me to assess my progress in that I could see what areas I was doing well and where I needed to add more effort (interview with Student A, November 2010)

As evidenced in the above excerpts, the students also benefited from interplay and interweave between formative and summative assessment in this course. Formative assessment supported them to enhance their overall achievement as they were able to improve their progress and achievements over time through opportunities to receive and use the formative feedback as they accomplished the ongoing and interrelated assessment activities. The interview responses from students also revealed that, although the students were committed to their learning, the grading of student achievements in the ongoing assessment activities to account for summative assessment was part of what stimulated them to pay more attention to formative assessment processes because it contributed to their grade for summative purposes. For example, students' participation within the online discussion forums was also being assessed for summative purposes, and this in part motivated their active participation.

With the assessment being ongoing and variety of assessment, it was kind of structure to the learning, so that was the advantage and also although I am usually quite motivated anyway, but when my motivation was low, by the fact that I had to do it because it was part of assessment, that helped me to continue with it as well. This also was useful because I knew when the deadlines were, what the requirements were... (interview with Student H, November 2010)

During the interview at the end of course, the teacher noted that her expectations in regard to the assessment approach in this course was to promote opportunities for meaningful learning that also fitted with the students' interests and needs. She indicated that the students' learning experiences and outcomes had met these expectations but in varying degrees.

My philosophy was that I wanted something that was meaningful and of interest to them; that related to their own contexts and interests where they would do something quite diverse under the umbrella of this course...The student performance through the course was satisfactory and I was pleased with the final results. Majority of the students were engaged in a scholarly and intellectual way, and had understood the assessment requirements; they did very well and got good grades which they had certainly worked for... (end of course interview with Teacher A, November 2010)

The online observations and analysis of the archived course discourse also revealed that ongoing documentation and publicity of peers' ongoing assessment work was an important aspect of the assessment structure in that it benefited students through allowing them to learn and enhance their understanding of expected outcomes as they interacted with

their peers' work. All the interviewed students recognized that interactions with peers' ongoing work (by being visible to all participants) served as examples and facilitated peer-peer learning support. The ongoing documentation and sharing of learning and assessment processes including publicity of ongoing work was purposefully enabled by the teacher from the outset of the course. As illustrated in the excerpt below, one student went further to recognize how authenticity inherent within the assessment activities discouraged surface learning or dishonesty issues among peers despite the enabled openness of their ongoing work. According to this student, the assessment approach in this course also shifted her previous perceptions and beliefs about educational assessment.

Initially for me the whole assessment thing has been very individual to me but in this class everything was so open and clearly there wasn't like a person is going to copy from you because although the assignments are related and we could learn from each other, they were still very different...my traditional training is that assessment is very personal especially in exams...I think that perception now changes in some way... (interview with Student G, November 2010)

4.5.2 Nature of the assessment activities

This theme explores the evidence of formative assessment with respect to aspects of: authenticity, learner autonomy and the emergent related processes (including active engagement, interactive collaboration, multidimensional perspectives and reflectivity). As illustrated in the following sub-sections, and further triangulated in Chapter 6 where relevant, these aspects were evident in the data obtained from various sources.

4.5.2.1 Authenticity (Complex and contextualized)

The summative assessments, and the integrated formative activities and processes revealed aspects of appropriate complexity and contextualization that manifest authenticity. The online observations and analysis of the archived course discourse revealed that the assessment activities were appropriately complex to sustain students' cognitive engagement over time. They included open-ended tasks that required students to engage in critical-thinking in order to successfully accomplish the activity. For instance, the preliminary investigation project (A3 assignment as described earlier) was an open-ended authentic activity that required the students to choose a relevant project topic in which they would explore a real-life and/or theoretical educational context within their own professional contexts, for example within the school they worked and then define relevant sub-tasks; and identify procedures and relevant resources to use in accomplishing this activity. The other three assessment activities were also authentic in ways that provided the students with opportunities to engage in deep thinking and connect the discourse to real-life applications.

The complexity with these authentic assessment activities was evident within the collaborative online discussions and students' reflective journals within which the students demonstrated high level of cognitive engagement. The following excerpts are examples of such instances.

At this point, after three readings of Chapter 8, I was frustrated by the authors' emphasis on 'design as practice'... This then became a dilemma for me -whether to largely ignore the text of the chapter and ask broad questions around issues I thought were also important or to follow the text closely but allow opportunity (through the extra questions) for other issues to arise spontaneously. I chose the latter approach and I was satisfied with the response (Student D, online reflective journal, 28 May 2010)

These chapters have been great to dip into and explore... I wish I'd seen them sooner!!! But the process of writing my proposal [assessment activity A4] has forced me to think about what I really do believe about the world and what we can know of it - sounds almost religious! I couldn't take on positivism in its entirety, although I hold the scientific method as one of the greatest achievements of humankind, enabling unprecedented progress, the improvement in the standard of living of millions and the inventions of really cool things like iPads! (Student H, 'Research design concepts' in online discussion forum, 7 October 2010)

During the interviews, the students also noted that they were challenged to think critically in their pursuit to accomplish the expected outcomes.

There were the harder things like investigation that I knew I needed to know how to do... and I had to do all the assignments [the ongoing assessment activities] but I had expected this kind of higher order thinking at this level of postgraduate (interview with Student B, November 2010)

The online observations and analysis of the archived course discourse revealed contextualized learning among students as they accomplished the assessment activities. During the interviews, all the 7 students agreed that the assessment activities were authentic and this supported them to connect their learning with their own professional work experiences and contexts, and other broader contexts. For example, one student expressed his experiences that reveal meaningful engagement with diverse perspectives and connections to his real-life professional practice and contexts:

The assessment activities were meaningfully engaging. I immediately realized what a variety there was from the class amongst the 11 participants and I realized the difference represented a spectrum of educational experience. In this class there was primary, secondary, other tertiary professional and university research scientist perspectives, so there would be at least four or five perspectives from the 11 people and no two experiences were actually very similar, so I got an incredible insight into technologies... I learnt a lot... I have an opportunity to actually work with this... I was able to make those connections and see what I could apply. My work [within own professional practice] is a mixture of technical and pedagogical, so these multiple perspectives were very illuminating (interview with Student D, November 2010)

One student went further to recognize that not only the ongoing assessment activities that were authentic, but also the learning environment in this course was in itself authentic. This student described how she learned other relevant professional skills as she engaged with the assessment activities, in particular, she learned how to learn online.

It was very relevant to learn how to learn online for me more particularly because we were learning about eLearning through eLearning, so it was very relevant to go through all those ideas like I cannot find this or that and I am frustrated. I think obviously you are going to go to a situation where your student are learning through discussion forums, even if it might not be completely online but part of it, so you can follow those steps to support them online...I could use it for some of the key things I do in my job... (interview with Student G, November 2010)

The online observations and analysis of the archived course discourse showed that the students were interested in what they could transfer to their own practice as they engaged with the assessment activities. This was evident in the online discussions and students' reflective journals as they constantly deliberated how their learning fitted in their own professional practice.

I'm interested in your [Student F] statement about 'what professional development needs to be in place for teachers to "fully embrace" and use the e-tools they have available' in the light of the massive drop-off in usage that often follows the arrival of a new technology...First of all, from a research perspective, this certainly involves organisational issues as outlined by Conole [one of the course reference textbook]. What is the school's management team's attitude towards curriculum development, planning for flexible learning, and professional development for staff? What gains are there for student motivation and achievement...as a result of organisational endorsement of technologies?...So this is our form of 'effective ICT PD' and its emphasis is pedagogical or providing learning support rather than technical but we try to combine both. I won't say that we have all the answers but the few of us that work in this area are making a difference and there are now potentially..... (Student D, 'The e-learning panorama' in online discussion forum, 12 March 2010)

During the interviews, all the students also noted in varying ways how they expected to apply the new knowledge they developed in their own practice. Student B confidently noted that through engaging with the authentic assessment activities she had learned something she eagerly wanted to transfer to real-life professional context:

For me, I would be looking in at a school that would need developing an eLearning plan. So I wouldn't like to go to a school now that is already fantastic in ICT and equipped eLearning. I feel like I want to go to a school that is starting their eLearning journey so that we could look at their vision, and needs. I feel really equipped now and I am much more stronger, confident leader and I feel I have got a good resource bank, I am now a professional eLearning leader and I feel if someone actually asked me a question about eLearning pedagogy I would actually have an answer... (interview with Student B, November 2010)

The teacher acknowledged that the students were able to choose and engage meaningfully with the authentic assessment activities in a way that fitted their own interest. This also supported them to make connections to their own real-life contexts.

Other aspects of authenticity emerged through the inherent processes that characterized the authentic assessment activities. As revealed by the analysis of archived course discourse, one of these crucial processes is that the assessment activities required the students to interactively collaborate with other course participants through sharing and negotiating the meaning of the course content that was structured around the relevant topics informed by the literature. Their participation in these collaborative discussions was being

assessed as part of their summative assessment. Online observations showed that the students participated actively in these discussions and this supported their group and individual learning. As students engaged with others within the discussions, they were able to share their individual perspectives, compare their thinking with divergent perspective from others, and respond to peers' views. This enabled students to enrich their perspectives as they discerned what was relevant to them as individuals from the emerging divergent perspectives. All the students also recognized the value of learning collaboratively in terms of diverse and contextualized perspectives that deepened their understanding of content and ability to apply their learning in real-life contexts. This is evident from what they said during the interviews.

Through the discussions, I was able to gain new insights from different viewpoints that came from my classmates. When different participants included their job experiences and contextual issues I found this useful to my understanding...the discussion forums were really helpful when my classmates brought in some examples relating to their job experiences and settings this enhanced my understanding and application (interview with Student C, November 2010)

Students were also stimulated to explore new possibilities and tools as they developed their understanding of content within social contexts. During the interview, all the students noted varyingly how they were stimulated to try out new web 2.0 tools. They also expressed how they expected to apply the newly learned skills in their own professional practice and contexts. For example, two of them noted:

The course assessment activities stimulated me to try new tools and see new possibilities. For instance, I was able to explore web 2.0 tools and how they can be used for learning so this is new idea I got during this course...I was able to appreciate how I could apply the idea of writing of a reflective journal in my context and do it with my students using web 2.0 tools... (interview with Student C, November 210)

The project [A3 assignment] made me reflect on new ways. I have actually learnt as result of this course for instance, sharpening my skills for searching, importance of collaboration which has been very meaningful to learn from others. For my school, I know we are preparing next year's programme and what I would like to share during the staff development forum...This course has really strengthened my perspective about potential of ICT and made me completely aware of how we need to get on board. So I want to go back to work and make some kind of difference with ICT by making those teachers in my school who don't think ICT is relevant realize how relevant...we have got some leverage with ICT (interview with Student A, November 2010)

The task for each student to facilitate a topic within the online discussion forums as part of participation activity was another aspect that promoted contextualized learning within the collaborative discourse. During the first week of the learning discussion forums, the teacher had provided the students with an opportunity to choose a specific topic that they were interested to facilitate from amongst the 9 key course topics. This was through a choice activity that the teacher had designed using a choice tool in Moodle, the LMS. The students had opportunities to initiate varying sub-themes within these collaborative discussion forums

which resulted to multiple discussion threads. At the end of facilitation period, the facilitating student was expected to wrap up the discussion by offering a concluding reflective summary. During the interviews, students expressed their diverse experiences which demonstrated that the facilitation task was both cognitively challenging and rewarding. They indicated that this task supported them to developed relevant content knowledge and pedagogical skills. For instance, Students B noted:

It was two folds; first of all you had to know the information of what you are facilitating and then you also had to learn how to facilitate, so it was an interesting way of learning... You were not just passively participating... you had to get to depth of information in order to build other peoples' participation... Though I had read thoroughly to understand the information as a facilitator, it was quite hard to understand everything initially, but after other people brought in their ideas to the discussion it was much better, so when they shared their ideas it sort of made my thinking much clearer (interview with Student B, November 2010)

This student had previously shared similar experiences in her reflective journal. Her experiences revealed that this task also gave students an authentic and safe environment to try out new possibilities and/or tools as well as enhance their facilitation skills.

In four weeks I have learnt to absorb what it is like to be a student online... and get to experience the best practices of online teaching. I now have the privilege of helping to lead our course on chapter two - and I have no problems in taking a risk with Mindmeister [a Web 2.0 tool] - better it fails with my peers here (not that it will of course) and we work on better ideas together than not trying it at all... I am giving myself a boot this week to make sure I am more scholarly in my writing - I am a fast thinker and blurter so I know that this week I will process and reflect better on the readings from all my courses... (Student B, online reflective journal, 22 March 2010)

The teacher also agreed that the students benefited from learning collaboratively and noted that they engaged meaningfully, although they had varying level of active participation as it would be expected in a typical classroom. Consistent with what the students had expressed, the teacher also noted that the students had enriching experiences from their role as facilitators and this had met her expectation. The teacher had purposed this facilitation task as an authentic way to stimulate students to apply their existing knowledge and experiences within a supportive learning community bound by common professional practice in a way that could foster collaborative learning and enhance students' facilitation skills. She had recognized that these students were continuing professionals who were coming to the course with diverse professional background and experiences particularly as teachers. She noted:

For me there were two elements in this... one was to engage with the content itself and again to experience the facilitation. It was also partly helping to create mutual responsibility in the class because if you want people to participate in your week you are going to participate in their week... By incorporating facilitation as part of course activity, I acknowledged that these students were people coming with life and work experience... I recognized I have got one set of experience that I can bring into the course but if you can multiply that across eleven people it can be a richer experience (end of course interview with Teacher A, November 2010)

Based on online observations and the analysis of the archived course discourse, the authenticity within the assessment activities triggered meaningful interaction with self (internal feedback or self-reflectivity) which was richly manifested within the students' reflective journals. The teacher had created an online reflective journal for each student which was made public to the other course participants (teacher and peers) in order to facilitate shared understandings and opportunities for formative feedback. As noted earlier, the students in this course were expected to record their reflections within their own online reflective journals that the teacher had designed for them through creative utilization of the discussion forum tool within the LMS. Although the teacher had provided the students with guidance on how to engage in ongoing meaningful reflective writing, she did not confine students to any specific style for reflective writing. Students demonstrated meaningful reflectivity that revealed awareness of their status as professional learners who were keen on enhancing their ability to transfer what they were learning into their own professional practice. As it will be illustrated in a latter theme (Section 4.5.4), the reflective journals were also open to the teacher and peers which stimulated opportunities for formative feedback. The following is a reflection posted by one student in her reflective journal which manifests how she interacted with herself while reflectively connecting her learning experiences with her professional experiences:

I'm really struggling at the moment - not with the course - I'm really enjoying the readings but in the back of my mind I have a small annoying thing - kind of like a fly buzzing round – called "reality"... "how is this going to work in reality?" ...I see myself finishing the course with a few more tools in my toolkit that may help engage my students better... and where to look in terms of what I can be doing to better utilise e-learning tools within my practice. I wonder if when I go back to school how much of what I have learnt will 'stick' - How do we take something like a new 'e-tool' or learning design system and deliver effective... (Student 6, online reflective journal, 18 May 2010)

Despite the benefits of authentic learning and assessment activities illustrated thus far, this also became a source of learning challenges to some students initially. This is evident in the collaborative topical online discussion forums where two students appeared to have some difficulties especially at early stages of the course in engaging with others in their online classroom. Their challenges were related to factors such as limited or lack of previous experience in online learning which was compounded by some other factors. For instance, Student C framing his experiences within his limited ICT background felt that there was a huge gap between his contextual background (prior professional exposure and experiences) in ICT as compared to most of the other students who he felt were more exposed to ICT tools and issues from their previous professional experiences. This student noted that sometimes it

was not obvious to understand some new terminologies (at least to him) that other students brought into the discourse which was frustrating at times. For student E, the learning style coupled with no previous experience in online learning was a source of challenge initially in this online setting. It was evident from these two students' reflections and interviews that, although these two students expressed their challenging learning experiences; they were increasingly able to overcome the challenges and engage meaningfully with the learning and assessment activities through their own strategies and support from other course participants.

So in this course, my challenge was the moments when I could not respond to others' comments because of not understanding their postings...This tension made me more slow and discouraged me...Despite these challenges, I would of course say we were gaining something from each other but I would say my challenge...so that is why I was struggling in understanding what they were saying (interview with student C)

At last I feel that I have been able to contribute within the forum discussion process. It has felt like a long journey to get to this point, but I was not going to give up as I have a passion for this subject of e-learning and I want to be part of its deployment at....(Student E, online reflective journal, 29 April 2010)

In the beginning I was finding the discussions quite intimidating. I was also being overwhelmed by the many threads that different people initiated for varying subtopics...The biggest hurdle for me to participate in the online community was having the confidence of knowing that I had understood what I had read... The break through moment for me was starting up... (interview with Student E)

4.5.2.2 Learner autonomy

The assessment activities in this course were characterized by learner autonomy that facilitated multidimensional perspectives in various ways through opportunities for choice and flexibility. As described earlier, the students had opportunities to choose from a variety of relevant tasks/topics. The analysis of the archived course discourse showed that learner autonomy that characterized the open-ended authentic activities provided the students with opportunities to engage in a variety of approaches which resulted in diverse outcomes in ways that exposed the learners to diverse possibilities and tools. For instance, the students explicitly articulated their positive learning experiences within their individual online reflective journals in relation to how the autonomy stimulated them to try out and use varying approaches/tools of their choice in accomplishing the assessment activities. They also had an opportunity to initiate and contribute in variety of sub-themes (multiple threads) within the online discussion forums. This was another valuable form of learner autonomy that provided an opportunity to articulate multiple perspectives within the online collaborative discourse. Students expressed how these opportunities exposed them to varying possibilities and tools in ways that shifted their thinking.

Because we come from different background, for instance, I am a primary school teacher, [Student G] is involved in research, with different role in the University, and was involved in high school teaching one time...I think everyone brings these diverse perspectives and this helps you to see aspects of the learning that I wouldn't have thought about myself (interview with Student H, November 2010)

Having many threads in the discussion topics was strength because what I would try to do was ...sort of formulate my own post and then go on to find someone who might have started one that connects with my ideas and I automatically go to that thread. But it didn't stop me reading the other things...Sometimes you could find what seemed different initially was actually making the same point (interview with Student G, November 2010)

Both analysis of the archived course discourse and students' interview transcripts revealed that the students also expressed how autonomy supported them to engage with the authentic projects (particularly for A3 assessment activities that was situated in real-life contexts) of their choice that also served their own learning goals and interests. This in turn enabled students to achieve outcomes that were valuable to them beyond this course:

The teacher gave an opportunity to look at our areas that were of interest. Being able to choose my assignment project topic helped me to be able to investigate an area that was of concern to us [my school] and this was very worthwhile (interview with Student A, November 2010)

With flexibility and choice I was definitely stimulated, that was one of the best things in this course in that I could choose a topic of my interest and do my own research...for example, I chose this topic... I was able to learn more about this perspective. This is something I can relate to, learn more about and probably even take to my Masters (interview with Student G, November 2010)

To one student, autonomy provided opportunities that went beyond meaningful engagement to supporting her demonstrate her capabilities and voice her learning needs:

During the facilitation, it was good because the teacher had given us an opportunity to choose our own topic. Because I had struggled engaging with others, I choose a chapter that was of my interest and one that I felt more comfortable with...I also tried to incorporate some simulations as I am better in practical than theory. This helped me have effective engagement with my classmates. It also helped me illuminate the challenges...which was also my situation (interview with Student E, November 2010)

Another student enthusiastically articulated various aspects of learner autonomy she valued in the course such as the teacher's flexibility and openness, and autonomy to pursue own interest in their chosen focus within the various assessment activities. She wrote:

Wanted to say that your flexibility [Teacher A] and openness about how and what we are doing is very refreshing, I know that I feel that you are really there to support us to not only pass the course, but to pursue the areas that we are most interested in...Reading everyone's ideas in this course is not a chore, it is enjoyable to follow our colleagues' ideas, inspirations and challenges...As reflection for facilitating our own online sections, a key is that you do allow differences in your learners, as you do in a normal class situation...it is enjoyable to be part of this experience (Student B, 'Fostering online interaction' in online discussion forum, 21 March 2010)

However, autonomy inherent within the authentic assessment activities also resulted to some issues of concern. In this case study, concerns emerged in participation within the

discussion forums where one student constantly posted long pieces of textual contributions that were intimidating to a number of other students. This was manifested by comments from some students within the discourse in which they expressed how they felt incompetent and less knowledgeable as compared to their peer. Interestingly, they were at the same time acknowledging his commitments in providing them with learning support. Responding to this situation, the teacher undertook her role as a moderator by privately contacting the concerned student to share how the lengthy contributions affected other students. However, this intervention didn't exactly result as intended which necessitated the teacher to employ a different approach by suggesting a definitive number of words to this student for postings within the collaborative discussions. The teacher noted that such interventions were also expected to be applicable to any other student although it was intended to be communicated if a student consistently posted lengthy contributions which could affect other course students' participation negatively. During the interview, this student expressed some concerns in reference to the degree of choice and flexibility in participation rubrics which the student perceived to be excessively flexible which the student felt that was less motivating to the highly active participants. In expressing this, the student noted:

I felt that the participation marking rubrics was flexible enough to allow people to go with minimal contributions...Although I realize how the flexible prescription in this course pedagogically gives the students the freedom of choice and flexibility, on the other hand it can ironically prejudice students who are highly motivated because there can be a perception of no point for putting extra effort if others don't (interview with Student D, November 2010).

During the interview with the teacher, she recounted this situation as a challenging experience in regard to managing the issue. She also acknowledged the efforts of this student in being very actively involved within the discussion as well as being a valuable learning support to the others. However, she had expected that the students would not exceptionally post in ways that could threaten their fellow students especially those with little or no experience online learning. Surprisingly, the students who were initially intimidated by their colleagues' exemplary postings eventually seemed to get more accommodative over time, and their perception started shifting towards aspiring to achieve levels of competencies as those demonstrated by some of their peers. One student wrote:

Student D is just so wise with words that his discussion posts blow me away! But it also invigorates me more to in my online reflective journal posting 'lift my game' - so it isn't intimidatory, it is exciting to think that with practice I can develop those abilities too... (Student B, online reflective journal post, 29 March 2010)

4.5.3 Shared understanding of learning goals, content and expected outcomes

This theme focuses on how formative assessment facilitated opportunities for shared understanding of learning goals, content and expected outcomes. This was especially in relation to fostering opportunities for dynamic interactivity among the course participants, and negotiated meanings of the assessment guidelines and rubrics, which in turn promoted productive engagement with the ongoing assessment activities.

4.5.3.1 Interactivity

The ongoing assessment activities both for the formative and summative purposes in this course stimulated various aspects of interactivity that supported development of a learning community which in turn enhanced formative processes through enabling adequate and enriched opportunities for ongoing monitoring, assessment and formative feedback. Online observations and analysis of the archived course discourse revealed multifaceted interactivity both among the students as well as between the students and the teacher. As it emerged earlier, the teacher had purposefully focused on developing an interactive learning community in this course as a means of fostering formative processes where both the teacher and students were active players. During the interviews, the students commented that they experienced the class as an interactive learning community whose members had common goals and interests, and were committed to support each other to achieve those learning goals and meet expected outcomes. One student expressed:

There was that feeling of collaborative knowledge building and so there was that community thing of saying I have read that and that might be interesting to somebody. Probably in a face-to-face class I wouldn't have known that was relevant to somebody's idea... That was a really enjoyable course. There was a good feeling among the participants, there was quite a good learning support, good learning community with lot of different perspectives. I was able to follow my own interest and learnt how to find relevant literature more easily... (interview with Student G, November 2010)

Online observations and analysis of archived course discourse showed that the teacher and students alike valued the interactivity and sense of community among themselves which students recognized as useful in supporting them to achieve their learning goals and expected learning outcomes. The students demonstrated a sense of mutual participation as they were conscious of reciprocally contributing to the collaborative discourse. They constantly used collective terms such as we, us, ours, others, community, and group in reference to the class as they articulated their ideas and experiences in ways that suggested that they recognized their common goals and interests towards shared practice (as professional teachers).

The students acknowledged the cognitive and affective support they received through interacting with other participants as they engaged with the assessment activities. During the interviews, one participant noted that:

With that group [class] it felt like there was a lot of thought in what people had written and it definitely expanded what I had taken out from the chapters... You know I am coming from a secondary school science teacher background...this is how it is from a primary school perspective... It was also useful to see other peoples' thinking and generally there were a lot of similar things in there, again one was not completely alone in not being able to do some things and so there were other people in sort of a similar situation (interview with Student G, November 2010)

Student G recognized the interactivity she experienced in this learning community and expressed that it went beyond supporting her learning to changing her perception about the value of interactive collaboration in knowledge building and the role of social processes particularly in formative assessment.

Seeing other peoples' work served as examples developing with time because it helps one know whether you are on the right track. Also, is quite useful because there were obviously huge overlaps between what people were doing and it was nice to be able to read something and think this fits what my colleague is doing and I could just say I have read this, this might be also useful to you... (interview with Student G, November 2010)

The online observations and analysis of the online discourse showed that these interactions were also characterized by casual and affective exchanges that indicated some sense of belonging and social bonding among the participants in this course. Some participants also appeared to be interested in interacting beyond the online classroom space. The participants valued these social relations as something that enabled them to feel presence of each other and build trust amongst themselves. The members of this class as a learning community also appeared to care about sustaining a harmonious relationship as they took efforts to clarify their previous response and/or actions in order to avoid being misconceived by other participants and hurting their feelings.

These informal social relations also served as a platform for support and encouragement to each other in accomplishing learning and assessment activities. As well, peer encouragement supported the students to enhance their confidence as capable online learners especially for those that perceived themselves as inexperienced in learning within online settings.

The online observations showed that a number of students went further to interact with other professional experts outside their online classroom as they embarked on the assessment activities. This supported them to think critically and see how the activities they were interested in could be structured to achieve outcomes that were valuable and realistic in real-life contexts. The analysis of the archived course discourse also showed that the students

shared the ideas they gathered from other external settings with others online in order to validate their understanding. The threaded excerpts below demonstrated such form of blended (real-life and online contexts) interactions where one student shared out ideas she gathered from an external professional expert and received formative feedback from peers and the teacher:

My A3 [the project assessment activity] is taking a hit. I asked my friend and colleague who is an experienced ICT Advisor (ex my cluster facilitator and now own business) to name some Technological spaces within schools - which he did...but...I was surprised by this, and worried. I haven't assumed that a technological space WILL always lead to better outcomes... my ICT advisor just doesn't think that I will find evidence of this...[Teacher A] or fellow classmates - any idea? (Student B, 'A3 Investigations - Plans and discussion' in forum for sharing assessment related issues, 26 July 2010)

I am about to try and put my own ideas down a little further...and I think will also be looking for support. I think that great spaces can only equal motivation or good practice to a certain extent...Perhaps the question should then be how does the design of learning spaces enable the changing pedagogy that is indicated to be needed to enhance learning with technology? Or perhaps you have to widen the area you consider... (Student G, 'A3 Investigations - Plans and discussion' forum for sharing assessment related issues, 26 July 2010)

I think in e-learning in general it seems so hard to isolate variables, such as learning space, to determine their effect. Instead of trying to isolate this variable, you could draw from our methodology course [anonymous-course] and take an emergent approach... Hmmm...Let me know how you get on (Student H, 'A3 Investigations - Plans and discussion' forum for sharing assessment related issues, 26 July 2010)

Have only just read your request for help and the replies from your colleagues! I realised how similar their comments were to my email to you earlier tonight. So, I thought I would post my reply here too...At the moment I think you have a topic that interests you but you need more time and information to help refine the research problem and develop a research question... Today we had a whole series of speakers - one from the [name withheld] College in Sydney...We were shown some very good examples of students working collaboratively using technology...I've included a link to their... (Teacher A, 'A3 Investigations - Plans and discussion' forum for sharing assessment related issues, 27 July 2010)

The above thread also reveals interactivity across different courses as Student H draws Student B attention to what was learnt in another course. Student H also shows interest to know how Student B's gets on later, which signals continuity of interactions. It also captures Teacher A sharing ideas drawn from her interactions with others outside contexts. The form of blended interactions demonstrated above conforms to the teacher's expectations, which she had said within a forum post:

I have deliberately thought of the assignments as being situated in your own contexts and practices. (And expect that you will also be learning informally from colleagues and others outside the course at the same time)... (Teacher A, 'Chapter 7 Designing for learning (17-21 May) Facilitated by Student H' in online discussion forum, 20 May 2010)

As introduced earlier in this chapter, interactivity among the participants was evident within the online discussion forums where the course participants interactively collaborated in negotiation of meanings. The degree of interactivity with the discussion forums is evident in various facets. One facet of interactivity is the threading that characterized these forums. There was threading in postings as participants responded to ideas and/or questions initiated by one of them and thus making the forums ongoing and conversational. Figure 4.6 depicts a single thread in within a topical discussion forum which shows nature of interactivity inherent in this course community. Figure 4.6 illustrates one of the 21 threads in the collaborative discussion forum illustrated earlier in Figure 4.2. A total of 11 of the 12 course participants including the teacher contributed to this thread. This thread was initiated by Student D and had 33 posts in total and depicts networked interactions among the participants. The thread depicted in Figure 4.6 is a representation of the many threaded discussion forums that were predominant aspect of interactive collaborative in this course. The arrow points at the recipient of the message while the number against the line represents the number of exchanges (posts). Therefore, the double ended arrow and numbers on both sides of the same line depict that the exchange was back and forth. The students who did not consent their contributions in the course are identified as ‘Anonymous’ in the figure below and in all other figures in both courses.

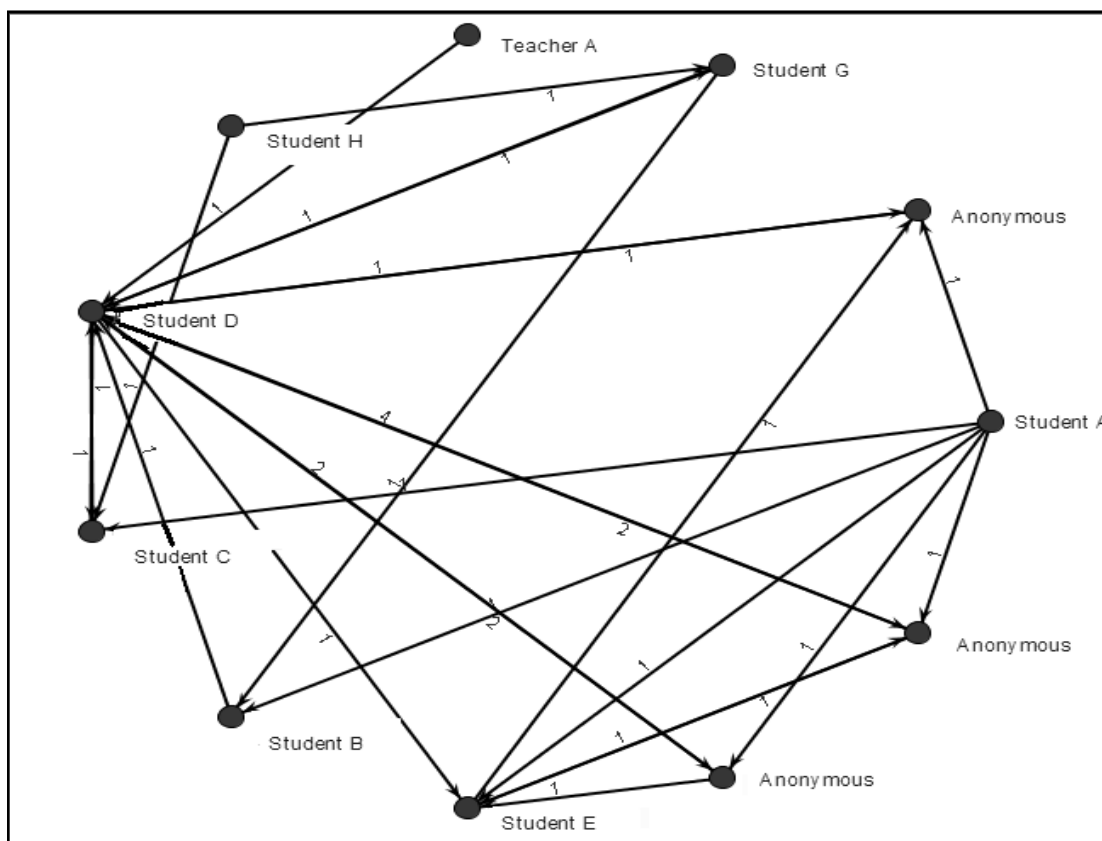


Figure 4.6: Network of interactions within one thread in the online discussion forum in Course 1: ‘The design of learning technologies’ facilitated by student A’ (interactions during the period: 23 April to 05 May 2010)

The online observations and analysis of the archived course discourse further revealed that the nature of interactivity as illustrated in Figure 4.6 was characterized by meaningful dialogue among the course participants. The ongoing documentation and sharing of learning and assessment processes also enhanced the quality of interactivity. This aspect was well supported by teacher’s creative utilization of the LMS tools including discussion forums and WIKI titled ‘class Wiki for A2 Professional Enquiry’. The online observations and analysis of the archived course discourse also revealed that productive interactivity emerged as participants kept referring back to the previous contributions/postings (their own or others) within the discourse. The aspect of revisiting previous postings as the course participants engaged with learning and assessment activities was well supported by capabilities for ongoing archiving and publicity of participants’ contributions within the online discourse. This aspect increasingly enhanced students’ self-reflections as they were able to engage with themselves as they reviewed response from others and/or responded to others. The 7 students interviewed confirmed that they valued the capability of being able to revisit previous

contributions especially when they wanted to reconstruct, confirm and/or enhance their understanding of course content. One of them noted:

I was able to sit down and actually take notes of the previous posts that I had made and I would also look at what others had said and I would build some point around their contributions. That helped me develop further ideas or expand on ideas and I was able to put another kind of perspective to the discussion. This helped to build on the posts that were there by being able to refer back (interview with Student A, November 2010)

The interviews with the 7 students also confirmed that they gained from collaborative interactions as they participated in the discussion forums and contributed their multiple and diverse viewpoints. A notable aspect from online observations is that, one form of interaction (for instance, interactions with others within the online discussion forums) fostered other forms of interactions (with content, tools and/or with self). In addition, these collaborative interactions supported students to engage meaningfully and connect their learning to real-life contexts. Analysis of the course discourse further showed that the interactivity within the discussion forums stimulated critical and reflective thinking as the students compared their thinking with that of their peers' and connected this to related literature and real-life contexts.

Huge thanks for your input [peers]- you've each given me something to go on so thanks. [Student G], you're right - it all depends on the question! I'm still mulling it over... I'm sure those reading will steer me in the right direction...[Student B], thanks I've read the same thing somewhere too regarding the amount of time it takes to embed a new technology and I agree about any new technology needs to become an 'expected' part of day-to-day practice... [Student D] Your experience is especially useful so thanks for sharing....Although my situation [at work place] is different, I have learnt (things about PD from your post...(Student F, 'My 'e' issues' in online discussion forum, 14 March 2010)

Another aspect of meaningful reflectivity emerging from interactions with content and others is evident where students in capacity of a facilitator were able to wrap up the topical discussions with reflective summaries within which they articulated their learning. Opportunities for multifaceted interactions also provided the students with opportunities to narrate their experiences, connecting this to the online discourse which some students articulated using self-composed metaphors. These articulations revealed reflectivity among the students both individually and collaboratively which also served as feedback to the teacher about students experiences within the discourse in this course. This excerpt demonstrates that the students valued the enhanced interactions they experienced in this course as compared to what they had encountered in some other courses:

...A fantastic discussion above everyone. [Student H], we are like peas in a pod, and knowing what other courses are like too - I have come up with this metaphor. Online learning can be like using a cell phone...online courses as online or online enhanced. To me that is like offering someone the use of a cell-phone. The online version is quite frankly quite terrible, and is like being given a old 1980' s 'brick' mobile phone. The online enhanced is like using an iPhone. Both are phones (both are courses), but the 'brick' one is so difficult to use you wonder how you are going to use it (or pass). The iPhone is so 'sweet' you enjoy using it, and

use it just for the sake of it!!!(Student B, 'Chapter 4 The design of learning technologies' in online discussion forum, 27 April 2010)

Both the online observations and analysis of the archived course discourse showed that the teacher constantly fostered the sense of being part of the online learning community as a co-participant and facilitator. She fostered shared purpose and also recognized herself as the leader of the learning community and monitored the efficacy of the process but avoided dominating presence to allow the students to discover the power and potential of collaborative discourse for individual and group learning. She valued the ideas and experiences that her students were bringing into the discourse and how this enriched the learning for all including herself. This is evident in this excerpt:

[Student D] your comments strike a real chord with me - the e-learning field is more like a vast terrain or a dense forest than a field!...I think one of the reasons why I liked Grainne's text was that it provided a bit of a road-map for thinking about the different pathways and perspectives of the 'e' terrain and helped me to locate my interests better. My own little patch of 'e-understanding' is just one bit of the landscape so I will be very much facilitator rather than sage - and I expect we will all learn a great deal from each other as we share experiences, questions and conversations...(Teacher A, 'Introduction forum' in online discussion forum, 2 March 2010)

The online observations and analysis of the archived course discourse further revealed that the teacher frequently injected her expert views and experiences within the discussion forums which revealed her status as an expert facilitator and more knowledgeable member of the learning community. For instance, she could reflectively sum up the group thinking and pick up on any relevant aspects that had not been addressed. This excerpt illustrates this:

[Student B], I also want to add a very sincere thank you for your enthusiastic and encouraging facilitation this week...The reading itself was a difficult one. On one hand it introduced some complex concepts and ideas - but did so in a relatively superficial way. In hindsight (isn't that a wonderful thing?!!!) perhaps we could have used a PMI activity to analyse different approaches to the Fictional Case Study...In essence this is the practical application of the work in the chapter. We should be able to understand the implications of different perspectives we are reading research articles - and begin to understand our own stance on knowledge and learning, and how this might... (Teacher A, 'Chapter 2 Discussion Forum (Facilitator: Student B): So to conclude' in online discussion forum, 31 March 2010)

The teacher acknowledged that she also learned from the discourse generated within this learning community in ways that prompted her to reflect on her pedagogical strategies. This is revealed in this excerpt:

To be honest I didn't stop and label most of the strategies but now that I'm forced to think about it can see that these theories did influence my thinking about the course. I'm learning here too! You challenge and inspire me with your contributions - and I gladly welcome the feedback although I am aware that you may all be a little too polite (or anxious) to say what you are really thinking in such a public way... (Teacher A, 'Chapter 7 Designing for learning (17-21 May) Facilitated by Student H' in online discussion forum, 20 May 2010)

Despite the various benefits emerging from the interactivity that characterized this course which were recognized by all the participants, some students also expressed some concerns that affected their interactivity and participation within the course discourse particularly at the initial stages of the course. Student G had this to say about her initial concerns as she adapted to the online settings:

Initially there was a bit of pressure where we were being assessed for participation in the discussions from the first day when I was still uncomfortable with online environment...but for most of the other things is like we tried a bit before we went on with the actual assignment...I presented information very formally because I guess that is how I have been taught to present information in a written format. To me that is what you do whereas other people were writing more conversationally and that sort of thing... (interview with Student G, November 2010)

Student A also noted that she was initially overwhelmed by learning within asynchronous online discourse but eventually overcame the challenge.

I was little nervous about that because...I was new to online environment which was an obstacle to me initially. I was not very visible online initially but I was actually reading everybody's post. I wanted to become visible but I couldn't, I eventually overcame that but I think that the lecturers need to take that in to consideration that at the beginning participation for some people may be affected as they get comfortable with the online environment... (interview with Student A, November 2010)

4.5.3.2 Transparency, negotiation of meaning, and application of rubrics

As described earlier in Section 4.3.2, the students were provided with analytical rubrics and clear guideline alongside each assessment activity. During the interviews, all the students commented varyingly about how they benefited from the analytical rubrics in relation to supporting them to monitor their progress and achieve the expected outcomes.

The rubrics supported me to monitor my progress. I was always going along making sure yes I have done that, what do I need to do, how I can make this better to get credit or something like that (interview with Student H, November 2010)

The online observations and analysis of the archived course discourse showed that even with the analytical rubrics, the students still valued additional opportunities to enhance their understanding of the assessment guidelines and rubrics. As well, the interviews revealed that students valued the examples that the teacher had provided. As noted earlier, taking advantage of the openness that characterized various assessment components as the course progressed, the students had an opportunity to interact with their peers' ongoing work, which they recognized as useful examples.

The teacher had also provided students with opportunities to negotiate meaning of the assessment guidelines and rubrics, and sharing their developing ideas. This was through an open forum for sharing assessment related issues/ideas. Analysis of the archived course discourse revealed that this open forum particularly provided the students with ample

opportunities to share their developing ideas for the authentic project assessment activity (A3). All the 11 students participated in this forum by posting their thoughts and/or questions. In the end, this forum had 13 threads with different sub-themes with a total of 63 posts. Figure 4.7 illustrates the nature of interactions that characterized this forum. Student A initiated the thread visualized in Figure 4.7 while sharing her developing ideas for the project assessment activity. Other six participants including the teacher joined the thread by giving their feedback. Student A recognized this feedback and in turn responded to her peers' ideas. This was back and forth process and a total of 11 messages were posted as messages in this thread.

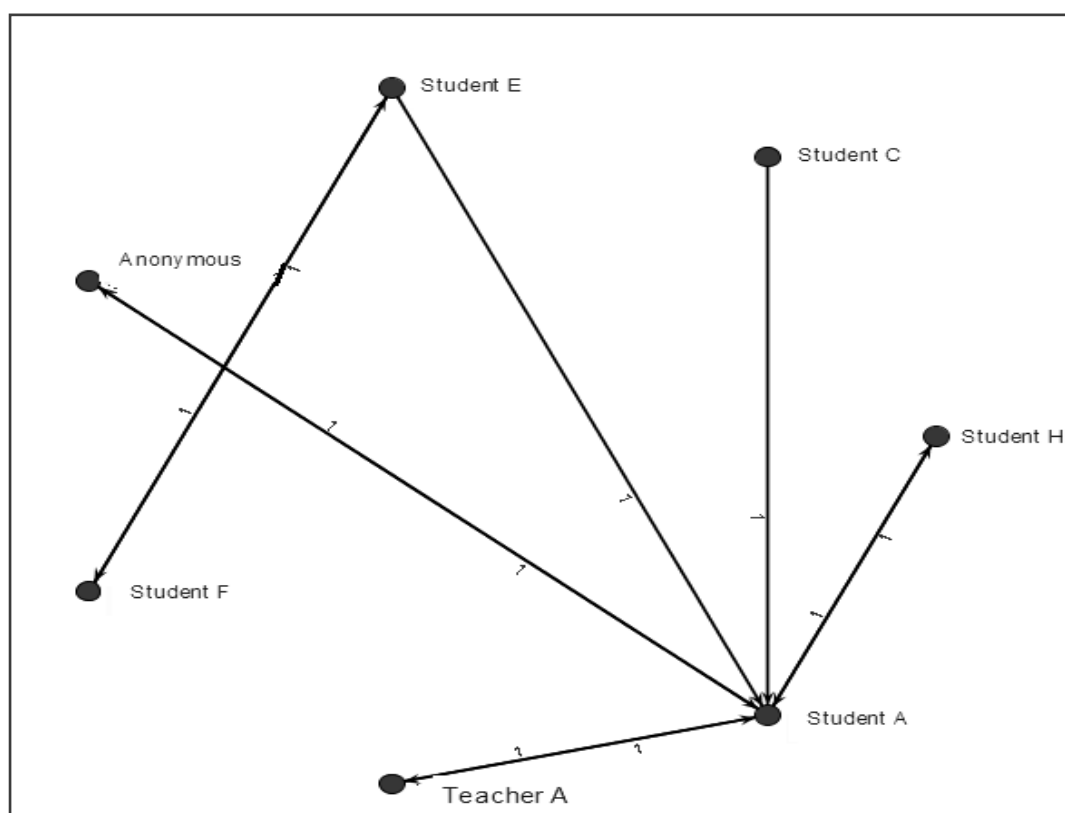


Figure 4.7: Interactions within one thread ‘A3 Investigations - Plans and discussion: A3 investigation plan so far’ in the forum for sharing meaning of rubrics and other assessment related issues/ideas (thread initiated by Student A sharing her ideas about project activity on 19 July 2010)

During the interviews, all the 7 students also expressed how they benefited from this forum for discussing assessment related issues by being able to see peers' developing ideas which served as examples, and through peers' questions and related feedback that prompted them to reflect on their own work.

Forum for asking questions about assessments was useful because sometimes you get an idea of how an assignment should look like and may be somebody else has a different idea. And I found that very useful seeing what other people were saying about the assignment and that helped me to enhance my understanding of what we were expected to do. So somebody would say something, another one would say I thought it was like this and a third person would come

in and then [Teacher A] would come in and clarify. So I went back to those posts a lot to clarify (interview with Student H, November 2010)

The teacher was flexible with the rubrics in order to accommodate emerging issues and the autonomy that characterized the assessment activities. The online observations revealed several instances of ongoing review of rubrics. The teacher involved the students when reviewing the rubrics. The students valued the flexibility that the teacher extended to them especially in terms of negotiating the assessment deadlines.

Within the courses [both Course 1 and 2] we study, there has been a fair bit of both. Both have been flexible to assessment dates - and isn't that refreshing!! No more begging for extensions, the lecturers have 'picked' up that the learners (us) weren't where we needed to be to achieve our best results (Student B, online reflective journal, 31 May 2010)

The online observations and analysis of the archived course discourse further showed that the teacher was keen to provide expert guidance to the students to support them enhance their understanding of the expected comes as they embarked on the assessment activities. For instance, at the outset of the course, she illustrated what was required in order to meaningfully engage with others online where she offered a recorded lecture using voice thread to guide on effective practices for online discussions. The teacher also provided a number of examples, as part of guidance, to reinforce the meaning of rubrics in relation to what was expected as assessment outcomes. Similarly, the teacher offered expert guidance to students by suggesting a number of possible project activity topics. She also made effort to demonstrate how to carry out some tasks by providing opportunities to practice using the tools that students were to utilize in their assessment activities. Observations also showed that the teacher also guided and scaffolded learning within the topical discussion forums, and where relevant, connected the topical content with what the students were expected to achieve in the summative assessment activities.

4.5.4 Ongoing monitoring, assessment and formative feedback (formative assessment by self, peer and/or teacher)

As it has so far emerged through the findings, this online classroom developed into a learning community in which responsibility was shared in facilitating meaningful educational experiences, where the individual learner, peers and the teacher were key players within the learning and formative assessment processes. Collaborative involvement within formative assessment processes included ongoing monitoring and assessment of the evidence of learning (which was being measured through the expected outcomes encompassed in the variety of ongoing assessment activities), and provision of formative feedback. As revealed by evidence from multiple sources, the ongoing archiving, and sharing of the learning and

assessment processes and products as part of the assessment structure enhanced opportunities for formative assessment processes. The role of self, peer and teacher in these formative processes are described in the ensuing sub-sections.

4.5.4.1 Self assessment

The assessment activities facilitated various opportunities for self-monitoring, assessment and reflections. For instance, both online observations and analysis of the archived course discourse revealed that students applied analytical rubrics to monitor and assess own progress and achievements. Self-assessment was also facilitated through the collaborative discourse within topical discussion forums in which individual and group reflections was evident as they articulated, deliberated their multiple perspectives, and discerned what was meaningful in their own contexts. The formative processes within the assessment activities such as the open forum for sharing assessment related issues/ideas also fostered reflective processes. This was manifested by how the students demonstrated awareness of their developing ideas and abilities, and constantly articulated their understanding of content with respect to how this supported them to accomplish the assessment activities. Reflectivity was also evident within their A4 presentations of artefacts as outcomes for the A3 assessment activity.

As revealed through online observations and analysis of the archived course discourse, the students' reflective online journals were another key aspect that supported self-monitoring, assessment, and reflectivity. The teacher had intentionally created these journals to be open to the other course participants from the outset of the course which was aimed at prompting external monitoring and formative feedback from the teacher and peers. During the interviews, all the student participants expressed that they benefited by writing their own reflections in the individual reflective journal as well as being able to interact with those of peers. A key aspect that students valued was the external formative feedback that was triggered by the posted reflections. For instance, Student A's reflective journal had 7 threads representing different reflective aspects. One of the threads was a reflective post on project assessment activity which prompted 8 feedback posts from the teacher and two peers. This student recognized this feedback and subsequently responded.

The students were able to monitor and reflect upon their learning journey as they referred back to their own reflective journal postings connecting their previous thinking to their current thinking. Some students also noted that writing their reflections was not spontaneous initially especially when they had to make it public to others but eventually it became natural and they recognized how they benefited from this publicity. As illustrated in

the following sample excerpts, the interviewed students expressed their varying experiences in writing their reflections in the open reflective journals:

I think it [reflections on one's learning and assessment processes] allows one to formulate ideas and show the journey of my ideas. So I think it is valid to have another process such as this one to show that I have changed my mind and so having that sort of reflection. So having some record to show the journey that I am taking was quite powerful because I could go back and have another look at it and I could say "I can't believe I said this and now I think this". I think it is quite powerful having other people seeing what I am thinking and coming back to give me feedback (end of interview with Student B, November 2010)

I would say one is always careful of what one is writing when you know others are looking at what you are writing...If I was to do it on my own without having being prompted, I don't know how I could have done it. Seeing what others were doing and getting feedback on my journal was helpful as learner and reflecting further on my thinking. So when other people commented back on my reflective journal more often it was helpful. Looking at people reflections also enabled me see others concern and this helped in my thinking (interview with Student A, November 2010)

During the interview, the teacher confirmed that the students benefited by writing their reflections in the open reflective journals. She noted that "most people used them [open reflective journals] well and it was useful in that some people put a question there and others respond to them" (end of course interview with Teacher A, November 2010)

Other aspect of self-monitoring and reflection emerged where students expressed that they learned from peers' ongoing assessment work that was open within the discourse as they compared their thinking and progress with others. Based on analysis of the archived course discourse that emerged within the forum for sharing A4 (the A4 presentations and peer-peer feedback forum), reflectivity was evident as the students were able to discern from the peers' artefacts what was applicable to their own work and contexts. They were also able to learn and/or stimulated to use a variety of new web 2.0 tools as they interacted with peers' artefacts.

The analysis of the archived course discourse also revealed that the students went beyond reflectivity to demonstrate metacognitive and self-regulatory processes in various ways within the processes of engaging with the assessment activities. The students were able to determine and look for additional resources that they required to accomplish the assessment activities. In doing this, they went beyond the assessment requirement to explore other resources and possibilities that had attracted their interests. The students also demonstrated awareness, and ability to set and reflect on their own learning goals. As well, the students were able to formatively assess how far they had achieved their goals. This was also confirmed during the interviews as shown in the following comments:

The reason why I took this course is that I wanted to build my knowledge about what ICT was all about and be able to implement what I learn when I go back to my school... could implement that in my own pedagogy. I felt I was benefiting from this course and if anything it really stimulated my enquiry into ICT and it has made me to realize the benefit of ICT...So I

feel like I have ability to decrease the digital divide because I have some knowledge in ICT and its relevance in learning, in education... so I want to go back to work and make some kind of a difference with ICT (interview with Student A, November 2010)

Both analysis of the archived course discourse and the interview transcripts also revealed that the students were aware and able to articulate about their strengths and learning needs especially as online learners. Students were also aware of their own learning journey and were able to identify what they needed to do to actively and productively engage online. For instance, three students who had little or no prior learning experiences online noted that they were able to devise their own strategies (also with support of others) that helped them overcome their challenges to adapt learning in this asynchronous setting.

4.5.4.2 Peer formative assessment

Online observations and analysis of the archived course discourse indicated that students were actively involved in the processes of monitoring and assessing their peers' progress and achievements, and provision of formative feedback. In this study, external feedback was considered to be formative when response to a question or an initial idea as posted by the author demonstrated that the responder as feedback provider recognized and understood the issue at hand, and provided views that either clarified and/or answered a question, or views that expanded, agreed and/or disagreed with the initial ideas of the feedback receiver. Peer formative feedback was thus manifested where individual students offered critical ideas and thoughts in response to peers' ideas and/or actions. These new ideas were either convergent or divergent in a way that expanded peers' thinking and this supported them to enhance their thinking and/or work. As it has already emerged, peer formative assessment through peer-peer monitoring, review and formative feedback emerged from various aspects in this course. Online observations and analysis of the archived course discourse revealed online discussion forums as one of the key aspects that supported peer formative assessment in which the students engaged with each other, sharing their thinking, connecting with peers' ideas, and providing formative feedback to their peers within this collaborative discourse.

Another aspect that supported peer formative feedback was the forum for sharing A4 artefacts. Online observations and analysis of the archived course discourse showed that, within this forum students were expected to review peer's completed artefact and provide peer formative feedback to at least two of their peers. This task of peer-peer formative assessment was assessed and accounted as part of their performance for summative purposes. As they offered their feedback, the students recognized exemplary peer's artefacts and offered their compliments. Some students went further to discern from peers' assessment work relevant

aspects that were applicable in their own and/or other broader real-life contexts. In receiving feedback, the students acknowledged how peers' formative feedback expanded their thinking in relation to improving their individual artefacts. The students were also in a position to defend their position and justify their ideas or actions in response to peer feedback. These aspects are evident within these excerpts posted as peer formative feedback within the forum for A4 presentations and peer-peer feedback:

I thought your [Student G] research idea was excellent - so much so that I'd like to try something like that when I get back into the classroom next year. Comments: ...the structure and logical flow was spot on...In terms of the research itself - I was envisaging this working better with a more junior group, say Year 9/10..... (Student F, 'A4 Showcase forum' in A4 presentations and peer-peer feedback forum, 24 October 2010)

I agree that getting responses is crucial to the blogging aspect but didn't include this as some studies commented on the unsubstantial comments created by forcing students to reply (Ellison & Wu, 2008)...I am interested in your comments on the age group. I always thought my A-level students were pretty opinionated and vocal! I take your point though and this brings up the issue of tasks like this being assessed...Do you see any way around this? If you are interested in the whole topic area then I am happy to share my assignment... (Student G, 'A4 Showcase forum' A4 presentations and peer-peer feedback forum, 24 October 2010)

Peer formative feedback was also evident within the open reflective journals and the open forum for sharing assessment related issues as the students applied rubrics to formatively assess their peers' developing ideas and progress, and in turn offered formative feedback. An interesting finding that emerged through online observations and analysis of the archived course discourse is how the use of open online reflective journals provided students with opportunities to interact with others (both teacher and peers) within individual reflective processes. This resulted in a constructive link between internal (self-reflections and assessment) and external feedback from others, which in turn prompted dialogic formative feedback and meaning making. These opportunities in turn supported the student to better understand and internalize the external feedback, and use it to regulate self for productive improvements. Inevitably, shared reflective processes increased learners' engagement in meaningful reflectivity. During the interviews, all the student participants expressed that they benefited by writing and making their reflections public. Online observations and analysis of the students' online reflective journals' content also showed that publicity or openness in these journals allowed students to access peers' reflections, thus enabling them to compare and assess their thinking and progress against that of their peers.

Figure 4.8 shows a summary of individual reflections posted online and the external feedback it triggered from others. As the Figure shows, there was always more internal feedback than the external feedback with an exception of Student B. It is also observable from Student G that higher number of internal feedback tended to elicit more external feedback.

However, there was no regular pattern or frequency in the online reflective journal's postings because there was no definite number of reflective posts required from the individual student and/or the responses from others. This implies that external formative feedback emerged fitfully depending on the nature of individual learning and reflective processes.

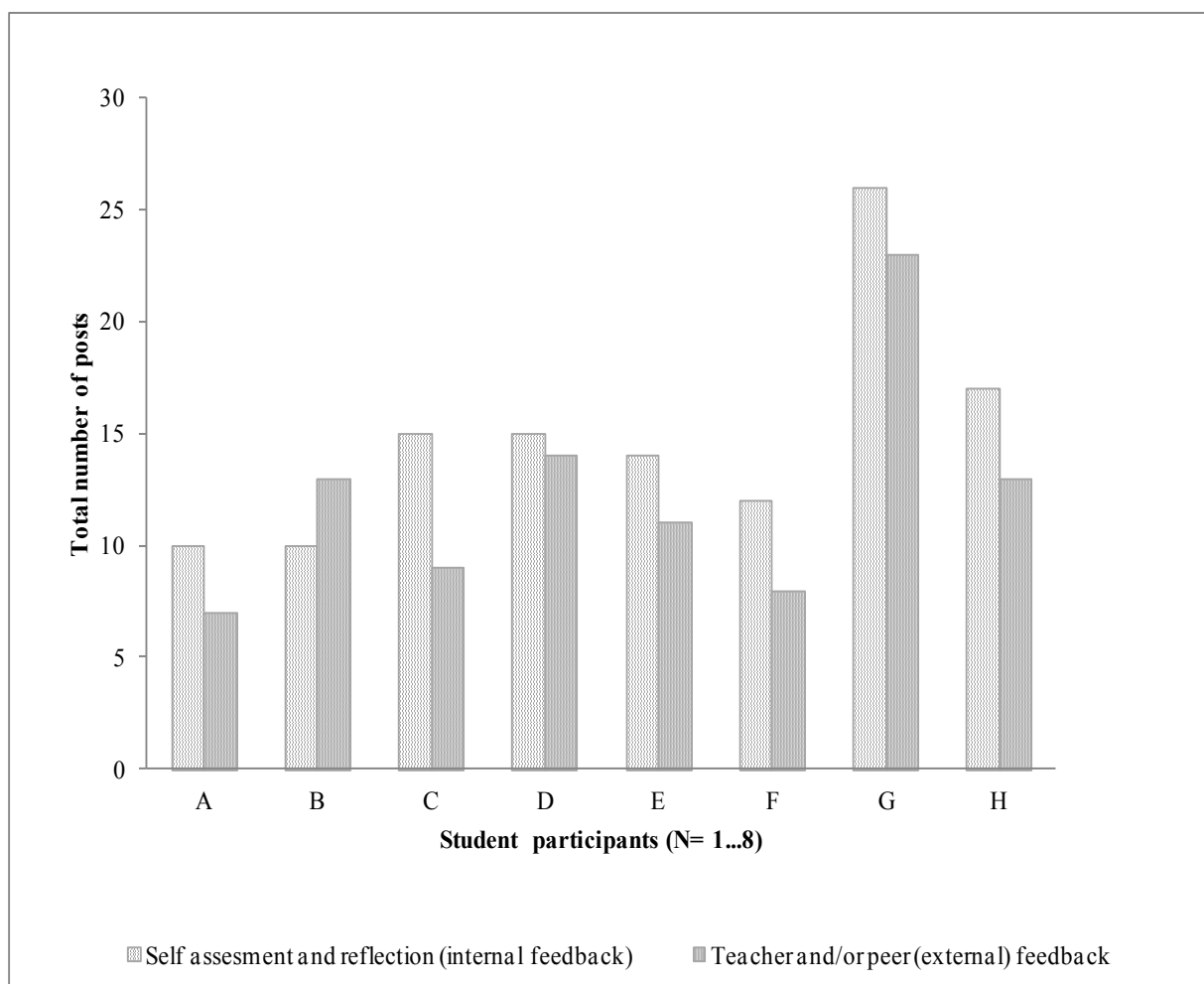


Figure 4.8: A summary of the total number of reflective posts in the student participants' online reflective journals, and the replies they received as external formative feedback from others (teacher and peers)

The interlink between internal and external feedback is illustrated with a sample of feedback loop between Student A, and the teacher and peers within Student's A reflective journal as depicted in Figure 4.9. In student A's reflective journal, there were a total of 7 threads resulting from her ongoing reflective postings. The thread depicted in Figure 4.9 was a reflective post about this student's developing ideas in relation to one of the assessment activities which prompted external feedback resulting to 8 interactive posts about that reflection. This external formative feedback was from the teacher and two peers. In turn, Student A recognized this feedback and initiated a dialogue with the feedback providers

(hence, self-assessment and reflectivity triggering meaningful interactivity) as depicted by double ended arrows as shown in the Figure 4.9.

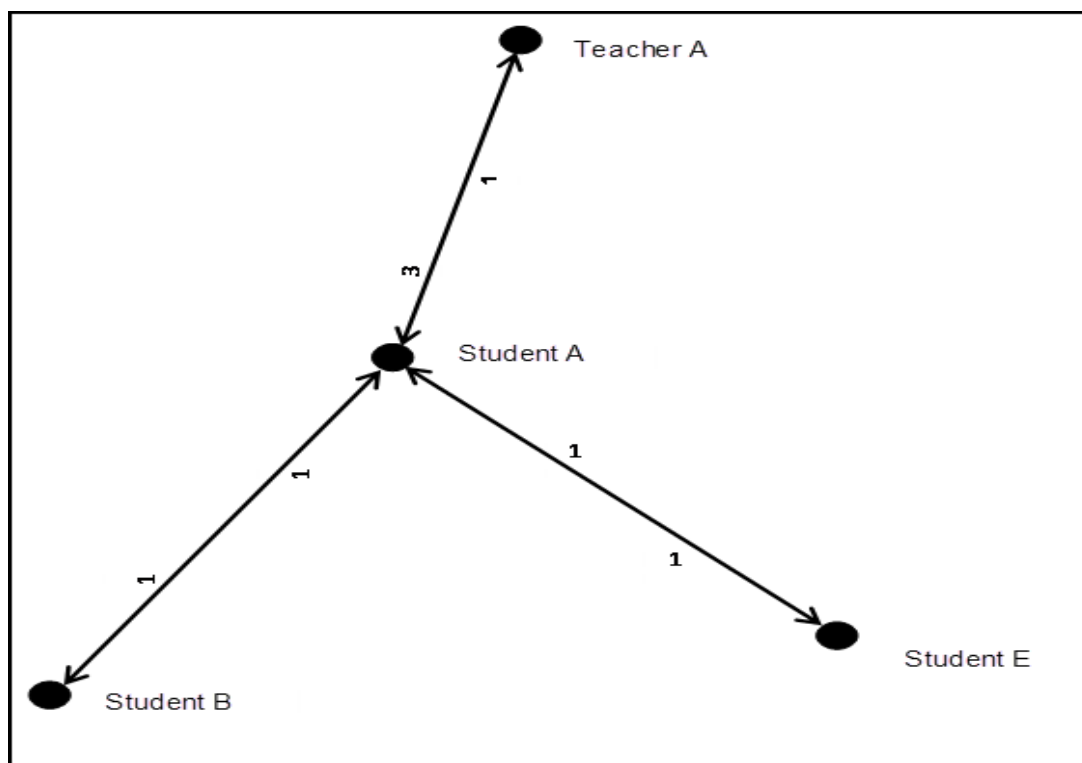


Figure 4.9: Typical interactions among the course participants within individual reflective journal (Student 1 threaded reflective journal postings about ‘A3’ through the period 15 June to 23 September 2010)

The analysis of the students’ reflective journals showed that opportunities to receive external feedback within the own reflective journal resulted to synergy between internal and external formative feedback in ways that stimulated meaningful reflectivity and interactivity among the course participants.

A distinctive aspect emerging from these formative feedback processes in this course was the immediacy and inherent interactivity. In receiving peer feedback, the individual students recognized the peer feedback, reflected upon it and in turn responded in a way that revealed that peers’ formative feedback had advanced their thinking as they went further to share back new ideas (feedback on feedback).

Peer formative assessment was also manifested through peer-peer learning support that emerged as students recognized themselves as source of learning resources to mutually support each other. For instance, some students added new resources which were relevant to the discourse within the online discussion forums. Other students went further to specifically

provide or guide their peers to relevant resources that were useful as they engaged in the summative assessment activities.

Online observations and analysis of the archived course discourse also showed that students valued peer feedback which was manifested by recognition of peers' capabilities and directly requesting for peer feedback and/or prompting for support from peers. This was either on aspects relating to technical issues and/or the course content. During the interviews, all the 7 students confirmed varyingly that they benefited from peer-peer formative feedback processes. They indicated that through providing peer feedback, they enriched their understanding, and that the feedback they received from their peers prompted them to reflect on their learning and assessment outcomes. They also noted that they learned valuable aspects that they could transfer into their future practice through these reflections and also from interacting with peers ideas and/or artefacts.

It [peer-peer feedback] helps to bring multiple points of view. The others can bring their ideas that allow you to think things you had not thought of. In this way it helped one to enhance my understanding of content, for example, I would put my ideas about what I might do for an assignment and I get feedback from other participants saying, have you thought about this, things I would not have thought about by myself... For me, the biggest thing was other people identifying how they could use what I had done. That is, I have given them something new to think about and they have also given me, so it was more of something that I could take away for future use rather than improving my [assessment] work at that point (interview with Student B, November 2010)

Online observations and analysis of archived course discourse showed that the teacher valued the peer-peer formative feedback and learning support that students offered each other. She constantly reinforced the peer-peer feedback within her feedback to an individual student and/or to the class. This is an instance where teacher recognized and reinforced on the feedback that Student A had received from Student B in relation to her developing ideas for A3 activity:

You [Student A] have already received some great advice from Student B...Your A3 assignment could well be to develop an instrument to help you understand student voice in relation to an aspect of elearning (Teacher A posting in Student A online reflective journal, 26 June 2010)

During the interview the teacher also noted that majority of students in this class were able to offer valuable formative feedback to their peers:

I think they really engaged with that....Some of the feedback was really good and thoughtful; it was around the practicality within implementing a piece of research, or around a theoretical question, have you thought about this or that about X which I guess that is what I expected...I think that was spread of what you expect (end of course interview with Teacher A, November 2010)

4.5.4.3 Teacher engagement with formative assessment

The teacher monitored the student learning as they accomplished the learning and assessment activities and tailored her formative feedback to fit their learning needs. The online observations and analysis of the archived course discourse showed that the teacher offered critical feedback through guiding them, critiquing what they had accomplished, and offering new ideas to expand students' thinking while also inviting further questions. The teacher also complimented the students for their achievements. The following posts resulting from a conversation between Student B and the teacher within Student B's reflective journal present an example that illustrate these aspects of ongoing teacher monitoring, assessment, and formative feedback:

My first question is how does this relate to e-learning and researching in, about or through an e-environment? Are you thinking of developing some online activity or application for evaluating physical learning spaces? If so, then your A3 project would need to research the content for your activity...As I mentioned in the guidelines this is a grey area and we would need to look carefully at what you were ...Feel free to comment and question some more as I'm sure these ideas will help others too (Teacher A posting in Student B online reflective journal, 11 June 2010)

Student B recognized the teacher feedback and was able to articulate how the formative feedback from the teacher had expanded her thinking.

Thanks [Teacher A] this is helping me to formulate my ideas - in my ideal world I would be writing the 'How to design learning environments'...Another way to think about this might be to conduct an investigation that finds out what innovative technology-enabled spaces...Your ideas above are great - an investigation using best practice models from a range of innovative spaces. I know of a few schools like this as well... (Student B, online reflective journal, 12 June 2010)

The teacher had continued to monitor student B's progress, offering further feedback:

Good to see your ideas formulating...My one little caution is to frame this as a preliminary investigation rather than a case study as such. I really want to keep the emphasis in this course...There is a fine line between finding out things in order to inform the development of a research proposal and actually doing a research study (Teacher A posting in Student B online reflective journal, 26 June 2010)

Based on analysis of the archived course discourse, the students also valued and expected teacher's feedback. They frequently invited feedback from the teacher by asking direct questions or prompting for support. During the interviews, all the students expressed that the teacher's feedback was formatively critical and timely in supporting them achieve the expected learning outcomes. Other valued aspects of the teacher's feedback that emerged from the students' interview responses relate to: (a) students benefiting from visibility of teacher feedback to other students, in the sense that, in most cases it also addressed their questions or concerns, (b) indirect answers or probes as opposed to direct solutions within the

teacher's formative feedback that provoked reflective thinking and deep inquiry, and (c) additional opportunities to seek teacher feedback privately through phone and emails. These aspects are illustrated in the following excerpts.

The teacher was very good at giving feedback, she mostly replied the first day. She was always quite open...she was very quick particularly when someone had a question that was stopping them from going further...Her responses were more of not directing you to something specific but just sort of making you take a step back and think a little bit differently; so it was like there was no right or wrong answer but hang on a bit and look at it from this angle and then one could see there are actually other perspectives...I think [Teacher A] was useful in picking up ideas possibly things we had not discussed that were relevant to the chapter, not telling us what to discuss but just raising points that we might need to consider (interview with Student G, November 2010)

I found the lecturer feedback actually fantastic, even when you look at the grade book, there are detailed comments that went along with that as well as the actual tracked changes in your marked document. It is like somebody sitting next to you talking it through with you. So it was really in-depth and I could keep improving my marks every time because I could take that feedback and if you were struggling, you were always allowed to do a phone call or an email, you felt like somebody was actually accessible to you all the time (interview with Student B, November 2010)

Another aspect within formative feedback processes was student-teacher feedback.

The teacher had structured the assessment activities in way that supported her to gather information from students about their progress and achievement in the learning process. This was aimed at offering formative feedback that was responsive to students' learning needs. Analysis of the course discourse showed that activities like writing reflective journal and open forums for discussing assessment related issues informed the teacher about students' progress and learning needs. The mid-course evaluation survey as a formative activity also served as a source of valuable feedback to the teacher by offering the teacher some insights in relation to adapting the formative processes and learner support to the emerging learning needs.

4.6 Summary of Case 1 findings

This case study examined how online formative assessment was embedded within Course 1 as part of embedded assessment and the meaning that both the students and the teacher realized from their experiences in this course. Formative assessment in this research was conceptualized as a holistic pedagogical strategy that encompassed four interrelated themes as illustrated in the previous section.

The findings indicate that integration of formative assessment within teaching and learning processes of Course 1 promoted meaningful learning and assessment. This supported learners to engage meaningfully in ways that supported them to develop deep understandings both in theory (what they were learning in class) and practice (connecting this to their own professional practice and other broader real-world applications). The findings illustrate that

the assessment structure in this course played a key role in promoting meaningful learning experiences and its ongoing assessment.

The variety of ongoing and authentic assessment activities provided a structure for both formative and summative assessment. It particularly supported the students to engage productively as they accomplished the variety of assessment activities to create meaningful products. The ongoing assessment activities, the enabled ongoing documentation and publicity of processes and products of learning and assessment stimulated collaborative processes where all the participants (the individual student, peers, and the teacher) shared the responsibility of monitoring, assessment, and providing formative feedback. The ongoing assessment activities sustained students' active engagement, and supported them to identify their areas of strengths and weakness, capitalizing on the strengths to demonstrate their capabilities and triggering support on their areas of weakness. Through such opportunities the students were able to enhance their understandings and achievements over time as they received formative feedback from both the teacher and peers.

The case findings indicated that the ongoing assessment activities were complex to sustain students' meaningful engagement in that they required them to engage in decision-making and problem-solving in order to accomplish an activity. The assessment activities also required and stimulated students to interact with real-life contexts which supported them to achieve meaningful outcomes in terms of both the processes and products resulting as their reified artefacts.

The findings further revealed that the authentic assessment activities provided the students with an opportunity to apply and share their prior knowledge and experiences particularly as continuing professionals. Sharing these within a supportive learning community was a key aspect of authenticity. This was evident as participants constantly engaged in meaningful online dialogue through articulating their existing knowledge and inherently narrating their professional experiences, as well as sharing their previous and current learning experiences within the online discourse. This in turn prompted critical formative feedback from peers with diverse experiences which supported the students to think beyond own contexts and connect to other broader issues and real-life contexts. In these ways, the diverse experiences enriched the discourse and supported students reflect upon their professional practice in meaningful ways both individually and as a community of professionals who shared common goals and interests in relation to applying ICT in education. Inevitably, this prompted the students to think in new ways that deepened their

understanding and improved their ability to transfer what they were learning to their own professional practice.

However, the opportunities to engage with authentic assessment activities were also manifested as a source of challenges to some students as a result of their learning style that did not initially fit well within online learning. An interesting finding is that these students were aware of their challenges and were able to devise their own learning strategies to support them devise better strategies and to adapt to learning online. Their peers and the teacher were also source of learning support to these students. These enabled them to increasingly overcome their challenges and achieve their learning goals. Another observation from this case study was that the contextual gap in relation to previous personal exposure and professional experiences among the students emerged as a learning challenge to some extent to one student.

The open-ended assessment activities and opportunities for choice and flexibility, which manifest learner autonomy, resulted in a variety of approaches leading to diverse outcomes, and hence multidimensional perspectives. The findings showed that authenticity and learner autonomy were not mutually exclusively as autonomy was shown to be facilitated by the authentic nature of the activities. Students were able to engage with variety of authentic tasks and focused on their own learning goals and interests. The interplay between authentic assessment activities and learner autonomy stimulated the students to self-regulate their learning and achieve meaningful outcomes that were valuable in real-life contexts.

The multidimensional perspectives emerging from diverse approaches and outcomes also exposed the students to diverse possibilities and tools. This exposure also became a source of learning through the opportunities for students to share their artefacts with peers and discern what was relevant to them from peers' artefacts. However, learner autonomy was also manifested as a source of concern particularly within the participation activity which was both a collaborative learning and assessment activity. The findings revealed that, although specific issues are not predictable, it requires the teacher to be conscious of such possibilities and be open-minded in order to be able to intervene appropriately.

Shared understanding of learning goals and expected outcomes emerged as a key aspect that supported formative assessment processes in this course. Clear assessment guidelines and analytical rubrics supported students in the processes of monitoring and assessing their own progress and achievement with respect to the expected outcomes. These in addition supported them to formatively assess their peers' learning. In that way, clear guidelines and analytical rubrics enhanced shared understanding that fostered shared

responsibilities among the course participants in assessing learning and providing formative feedback. Examples were also useful in enhancing students understanding of the expected learning outcomes. Moreover, findings show that sharing of ongoing assessment work among the students played an important role in relation to peers' work serving as examples. This confirms that shared understanding of learning goals and expected outcomes is crucial in formative assessment.

The open forums for sharing assessment related issues and ideas also played a key role in enhancing shared understanding and supporting students to achieve the expected outcomes. The forum offered a platform for seeking clarity on rubrics and asking other related questions which in turn prompted other course participants (teacher and peers) to provide desirable formative feedback. Commonality of needs amongst the students and the enabled openness of learning and assessment processes and products prompted common formative feedback that was shared concurrently. This implies that students benefited from their peers' feedback. The findings further indicate that commonality also served as a source of encouragement to the students by recognizing the similarity of their learning needs thus enhancing their confidence. The teacher played a key role in supporting students to understand the expected learning and assessments outcomes through ongoing expert guidance and modelling. Additionally, the students valued the learner autonomy permitted by the teacher in negotiating meaning of rubrics and the flexibility within the assessment guidelines and analytical rubrics in response to the evolving understandings and emerging issues.

The findings further revealed that the overlap and interweave between formative and summative as part of the assessment structure in this course became a core strategy for supporting engaged learning and ongoing assessment. As it emerged in the findings, the overlap and interweave supported students to enhance their overall achievement by supporting them to close their performance gap as they received ongoing formative feedback and in turn use it to revise their individually created artefacts that were graded for summative purposes. The findings also showed that, although the students willingly took responsibility for their learning as manifested through the aspects of self-regulation, the overlap between formative and summative assessment partly motivated them to pay more attention to formative processes. Another fundamental aspect inherent within the assessment structure was the teacher's beliefs that strongly influenced her approach to teaching and assessment. This is evidently manifested in her explicit articulation of her pedagogical philosophy with particular recognition of embedded assessment (particularly for formative purposes) as part of teaching and learning.

In this case study, the formative assessment processes of ongoing monitoring, assessment of learning and formative feedback were manifested as a shared role among the teacher, individual student and peers. The findings revealed three core strategies of formative assessment that resulted from shared responsibilities; namely, teacher, self and peer formative assessment. Teacher engagement with formative assessment as a core strategy entailed various components. The teacher was a key player in fostering collaborative and interactive formative processes as she emphasized shared role with students in ongoing monitoring and providing formative feedback. She recognized the value of the formative feedback the students provided to their peers. The teacher also played a key role as a subject matter expert, experienced facilitator, and in guiding the students through the shared formative processes. Students valued teacher's ongoing guidance and feedback as timely, formatively useful, and a learning scaffold (guide that supported them move to the next level of knowledge), and in turn supported them achieve the learning goals and expected learning outcomes. The formative activities and associated processes provided the teacher with variety of opportunities to gather valuable information from students which enabled her to tailor her feedback to the students' needs. The interactivity within the strategies also prompted the teacher to reflect on students' progress and achievements as well as upon her own practice.

Self-assessment was evidently a core strategy in this course as the students monitored, formatively assessed and reflected upon their own progress and achievements. These aspects of self-assessment were elicited by various elements and techniques within the embedded assessment activities including analytical rubrics, online discussion forums, online reflective journals, self-assessment and peer-assessment tasks, and the forum for sharing assessment related issues/ideas. Students' engagement with self-assessment processes fostered reflective learning that enabled them to connect what they were learning to their own professional practice and real-life context, and other broader contexts.

Other valuable aspects that emerged within self-assessment were self-regulation and metacognition. Students were engaged in self-regulatory processes such as sourcing for additional resources to enable them accomplish assessment tasks, directly asking questions or prompting for support from others, and following their interests beyond the assessment requirements. Metacognition was manifested in various ways such as setting own learning goals, articulation of own learning, recognition of self as source of learning support for others and awareness of their learning needs, and in students devising better strategies to meet their learning needs.

Peer formative assessment was another core strategy of formative assessment. This emerged within the collaborative online discussions as students shared and negotiated meaning of content by first composing their individual perspectives and then comparing these with diverse perspectives from peers, as well as giving or receiving formative feedback to peer, hence peer-assessment. The formative feedback among peers was characterized by immediacy, interactivity, and mutuality. Sustained interactivity supported development of a robust learning community, which in turn fostered collaborative knowledge construction. This was evident as learners were able to evaluate the diverse perspectives and built new interpretive frameworks and adopted perspectives that were meaningful and relevant to their individual contexts.

Peer formative assessment was also evident within the open reflective journals where students monitored and assessed their own and peers' thinking, and offered formative feedback. The analysis of students' reflective journal revealed a productive synergy between self and peer formative assessment. The use of open reflective journals in this online course provided students with enriched opportunities to elicit external formative feedback from others (both the teacher and/or peers) as students self-assessed and shared their progress and achievements. The open forum for sharing assessment related issues also revealed aspects of peer-assessment as students were able to respond to questions/comments posed by peers. It was clearly evident that effective peer-peer formative feedback promoted reflective thinking as the students sought to justify their comments within their feedback. The peer formative feedback supported students in self-improvement as they articulated their position, justified their ideas or decisions and/or acknowledged how the feedback enhanced their thinking. Additionally, peer-peer formative assessment supported contextualized learning as students were able to discern what they deemed to be relevant in their own professional practices and contexts, and other broader contexts.

Moreover, the synergy among these four core strategies of formative assessment discussed so far reciprocally nurtured development of an interactive learning community as an emergent strategy. It is important to note that the emergent learning community was strengthened by recognition of shared practice and identity among students as practicing professional particularly as continuing teachers. This was manifested by a strong sense of mutual engagement among students as they shared diverse perspectives within the collaborative discourse that were inherently characterized by articulation of lived experiences as professionals. Inevitably, the development of an interactive and supportive learning community as an emergent strategy enhanced the shared responsibilities within self, peer, and

teacher engagement with formative assessment. The use of the term ‘emerging strategy’ is to indicate that within the context of this study, the course design was intended to be flexible in order to accommodate various aspects that would foster self, peer and teacher formative assessment. The emergent learning community indeed enhanced the core strategies and ultimately fostered opportunities for interactive, collaborative and reflective discourse. It was evident that the existence and recognition of shared practice and needs, dispositions towards developing new or improving own competencies, and aspirations of changing own current identity within the emergent online leaning community contributed meaningful learning experiences. As illustrated through the findings, this was particularly stimulated by engagement with authentic assessment activities situated with real-life practices while interacting with others. This in turn triggered application of prior knowledge and experiences. As well, this stimulated interactive and reflective discourse, and contextualized formative feedback in that it was constantly characterized by articulation of real-life professional experiences.

Another interesting and overarching finding in this study was how the interrelated aspects of formative assessment nurtured the development of an interactive learning community without the need for the teacher/designer to anticipate the dynamics of interactivity amongst the members of the learning community. Exemplifying reciprocity, the evident dynamic interactivity influenced the nature of formative feedback in this course. There was no need to predict the students’ actions, comments, responses and/or questions in order to provide desirable formative feedback because the participants had progressively developed the willingness to make their thinking visible to others. Similarly, it pre-empted the need to predict the source of that feedback as participants had become mutually responsible for each other’s needs. To foster this sense of shared/mutual responsibility, it also required the teacher to ensure the efficacy of the interactive and collaborative processes, and share the power of controlling the processes with the students in order to facilitate effective formative feedback processes. In effect, what it required was vigilance and open-mindedness on the side of the teacher in order to responsively meet the emerging needs amongst the students and manage any issues of concerns. These interrelated aspects and processes of formative assessment facilitated valuable learning experiences and outcomes.

In overall, this case study illustrates that embedding assessment within teaching and learning processes for both formative and summative purposes offered an innovative pedagogical strategy that promoted meaningful and transferable online professional learning in ICT education. This was manifested through enhanced learners’ engagement with valuable

learning experiences including active, contextual, interactive collaboration, reflective, multidimensional perspectives and self-regulated aspects of meaningful learning. In addition, the ongoing formative assessment enhanced opportunities for interactive formative feedback which supported and scaffolded learning, and in turn fostered deep learning and equitable education. In these ways, formative assessment was an effective pedagogical strategy that supported the teacher in this course to *design for meaningful learning* as opposed to *designing learning*, and by implication, the learning resources and opportunities were shaped by emergent learning experiences as opposed to prescribed structures and content.

To enhance understandings of how effective integration of formative assessment may be achieved within online contexts, and confirm (or disconfirm) the findings of the current case study, another case study was conducted within the collective case study design. This entailed an in-depth investigation in a different course bound by common phenomenon, but with both similar and varying contextual influences. This second case study is presented in the following chapter.

Chapter 5

5.0 Case 2

5.1 Introduction

This chapter reports Case 2 (a case study of Course 2) which was the second online course in this research. As in Case 1, reporting of this case study focuses on providing rich descriptions of how formative assessment was integrated in Course 2 as part of embedded assessment; and the meanings that the course participants realized from this. The first part provides the case context, description and course design including the assessment structure. The chapter proceeds to present details about the research participants followed by the case findings and related discussions. The case findings focus on exploring the evidence of application of formative assessment in Course 2 guided by the key research question. Similar to Case 1, theme-based narrative style was chosen to present the case findings. This chapter, in part, has now been submitted for publication in a peer-reviewed journal.

5.2 Case context

Course 2 ran for a period of one academic semester and it started mid-way Course 1. Course 2 was offered in the second semester of year 2010 within the university calendar as part of the requirements for postgraduate Diploma programme in ICT in Education. The course covered 16 weeks from July 12 to November 8, 2010 including the semester mid-break and other public holidays. The course was also considered as part of the requirements towards a Masters degree in Education (MEd). Course 2 was hosted within the same LMS as Course 1. All teaching and learning processes were facilitated online where asynchronous mode was the main form of interaction. Capitalizing on an affordance of the LMS, all the course content and related discourse were archived progressively on the online classroom space.

5.3 Course description

The overall aim of Course 2 was to support the students to develop critical awareness of pedagogical issues in relation to integration of ICT into pedagogy within face-to-face, blended, and online classroom contexts. As in Course 1, the aim of Course 2 was available to the potential students as published in the University brochure for the postgraduate Diploma programme. The following is an extract from the brochure:

The course focuses on developing a critical awareness of the pedagogical issues involved in the integration of information technologies into classroom practice. Exemplars of curriculum based activities involving a variety of information technologies will be related to theories of learning and relevant academic research. Participants will further their computer application

skills as well as investigate, analyse and evaluate contemporary theories and predictions related to the use of computers as effective teaching/learning aids in education (Course 2 description in the University course advertisement brochure to the potential students, Year 2010)

Specifically, the course aimed at exposing the students to variety of ICT tools (particularly web 2.0 tools) and their application within teaching and learning processes; and also provide the students with opportunities to explore existing research and critically examine contemporary theories and predictions in relation to effective pedagogical use of ICT. Students had opportunities to connect these aspects to real-life professional experiences by engaging in activities that required an inquiry focusing on application of various e-learning aspects within real educational contexts.

Figure 5.1 shows the home page of Course 2 within Moodle environment. The depicted web page contains links to the course schedule titled 'start here', course weekly-based sections, a '*kete of work*' that linked to the key activities in the course, and a news forum. The home web page also shows an overview of the core themes of the course content developed collaboratively by the course participants within the online discourse which were generated using 'Wordle' image (a Web 2.0 tool that was not a feature within the LMS). These themes emerged from students' participation within the topical online discussions. Using Wordle, the teacher collated the themes at the middle of the course as an innovative way of pulling together and summarizing the key concepts emerging from shared discourse and then posted them on this web page. At the outset of the course, the teacher had outlined all the key course activities and forums on a web space titled kete of work that was linked to this home page through which she was able to explicitly put together the course learning activities and assessment, and related aspects from the outset.

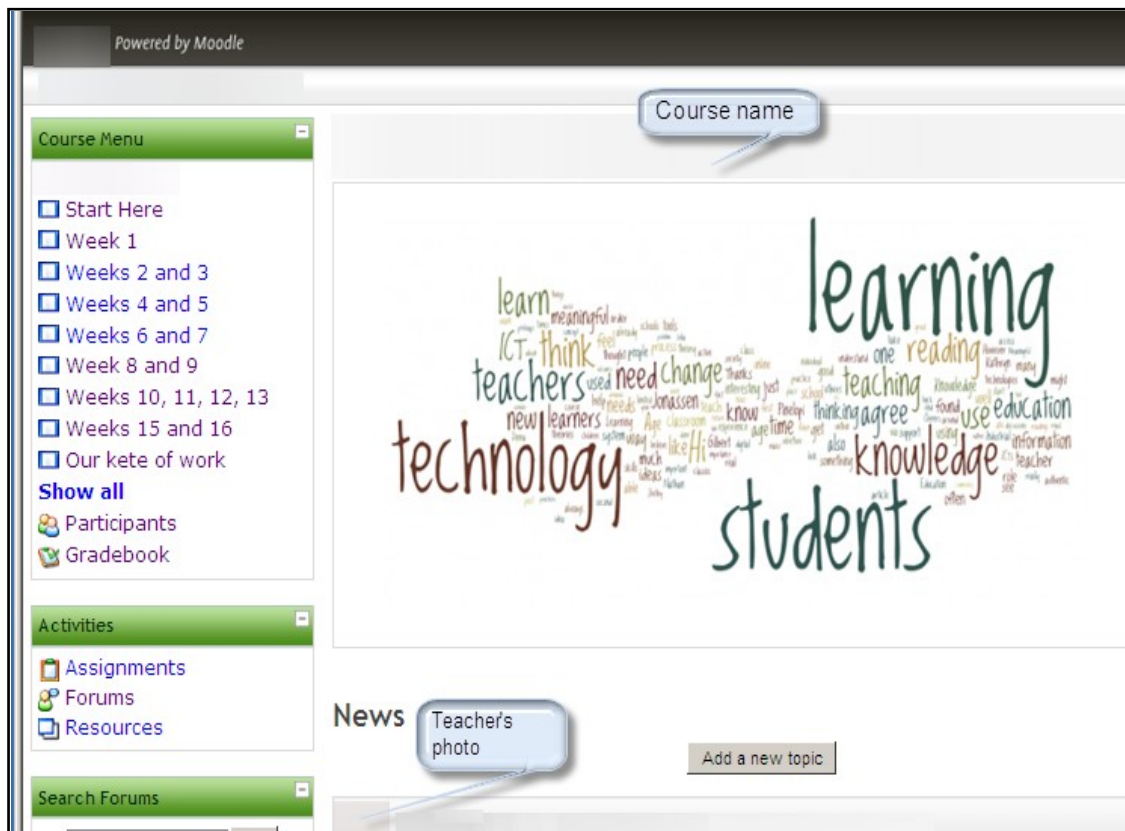


Figure 5.1: Home page of Course 2 within the LMS titled ‘e-learning and pedagogy: Effective strategies for the classroom’, that included the links to the course sections and summary of key themes visualized using ‘Wordle’ (screenshot captured on November 15, 2010)

Similar to Course 1, Course 2 was designed and taught by one teacher with very little support or intervention from the University e-learning advisors and designers. Like Teacher A, the teacher (identified as Teacher B in this study) had ten years experience in teaching online and thus she had developed her skills over time in designing and teaching online courses.

5.3.1 Course structure

The teacher had structured Course 2 into weekly-based sections. These sections are broadly categorized based on the targeted outcomes:

1. Introduction and guidance section that was titled ‘Start here’ in week 1, the teacher presented the course activities and summative assessment requirements by ensuring they were explicit to the students and offered guidance on meaningful online interactions. Within the first week, all students were also expected to undertake an introduction activity by presenting their biography with various aspects relating to their demographic data (with an option to conceal what they were not comfortable sharing within their online classroom). Here is a sampled excerpt of how the students

introduced themselves, “I am [Student J] and I live in Christchurch for the last eight months. I come from...and I am a primary school teacher with a Master's degree in Science Education. I have worked for five years...” (Student J, ‘in the forum ‘Introduce yourself here’, 12 July 2010). This activity provided the participants with opportunity to get to know each other and to acclimatize to the online classroom.

2. Learning sections starting from week 2 up to the 10th week focused on the main course content. All the learning sections had discussion forum(s) within them to facilitate shared understanding of the course content through interactive discussions.
3. Focus on authentic project and sharing of artefacts: The focus in the last two course sections (four weeks) of the semester was engagement in the ‘action research project’, and writing of the ‘position paper’. These entailed engagement in these activities and related processes for both formative and summative purposes including students showcasing their action research artefacts and receiving formative feedback. The details of these aspects will emerge in the case findings.

At the outset of the course, the teacher provided a detailed guidance in relation to the expected forms of interactions within the online discourse. She explicitly defined what it meant to engage constructively in an online learning setting in order to facilitate meaningful collaborating learning and the achievement of the expected learning outcomes. In elaborating this, Teacher B explained:

The purpose of our online discussions is for us to share understandings and create new knowledge. As a group we know much more than we know as individuals. I hope that you will find that engaging with others about what they think and know will be a rich experience for you and will create new meanings about ICT in education for us as a group and for you as an individual...there are no right or wrong answers in these discussions - just viewpoints, ideas and opinions that may be similar to or different from the viewpoints, ideas and opinions that you hold or that I hold... (Teacher B, ‘Week 1’ guidance in section 2 of the course LMS, July 2010)

The weekly-based learning sections focused on topics that covered the course content. In particular, the focus of these learning sections was based on course themes/goals. These learning sections were characterized by threaded discussion forums which revealed interactive collaborations that were at the core of the teacher’s pedagogical approach in this course. As it will be explored later within the findings, the teacher expected all the students to participate actively and meaningfully within ongoing collaborative discourse. The teacher provided the main theme of the discussion topic explicitly at the outset of every learning section. Each topic developed into multiple discussion threads focusing on variety of sub-topics. As part of

each of the learning section, the teacher also provided variety of relevant Web 2.0 tools for students to try out as they interacted with others (teacher and peers).

Similar to Course 1, the teacher had designed for embedded assessment that was ongoing and seamlessly integrated within teaching and learning processes in ways that served both formative and summative purposes. As such, the processes and products that resulted from students' engagement in a variety of ongoing learning and assessment activities formed the basis for an overlap and interweave between formative and summative assessments.

5.3.2 Summative assessments as part of the embedded assessment

Summative assessment in Course 2 was ongoing and was based on activities that aligned with the course goals and expected outcomes. The summative assessment was structured into four ongoing activities, namely: participation within the online discussions, the annotated bibliography WIKI activity (also referred by the course participant as Assignment 1), action research project (Assignment 2), and the position paper (Assignment 3). Each of the first two assessment activities were graded to account for 20.0% of individual student assessment for summative purposes while the latter two accounted for 30.0% each. These four assessment activities were distributed throughout the course duration. The teacher had provided detailed assessment information at the outset of the course. Figure 5.2 shows a screenshot of the assessment information from the course LMS which is a Webpage containing Course 2 summative assessment information. The Figure provides an overview of the assessment activities and how they mapped onto each other. In addition, documents containing the detailed summative assessment guidelines and rubrics (the rubrics for each of the four activities are provided in Appendix 4.A), and the due dates for each were provided on this page. The participation activity ran through the first-half of the course duration (for the first 7 weeks) and it informed all the other three activities. The annotated bibliography activity overlapped with the participation activity. The action research project started after the 8th week of the course period. Building on the annotated bibliography, the position paper came towards the end of course.

An overview of the assessment

The assessments in this course are designed to build on one another - Assignment 1 - participating in an investigation and dialogue about elearning tools and strategies helps to inform the planning and implementation of Assignment 3 - your action research inquiry. Assignment 2 - building a bibliography will be the preliminary work on your position paper. In this paper you will take a position and support it through your own experiences and through the literature you have read. You may have already identified an area of interest about ICT and learning that you want to explore - but if you haven't it would be good to think about this. Identifying an area of interest will help you to work strategically. Some examples of a focus might include such things as (and you will think of many more!):

Today's students are different due to their constant access and use of technology
The digital tools that we use today are changing the way we learn
[Is Google making us stupid?](#) (An intriguing idea put forth in the July issue of Atlantic Monthly)
ICT has the capacity to engage reluctant students in learning
Today's teachers need new skills and knowledge to teach in the 21st century classroom

Here is a visual to help you see how the assessments build on one another:

Assignment Information

- [Participation](#)
- [Rubric for Participation](#)
- [Annotated Bibliography](#)
- [Rubric for Annotated Bibliography \(Assg 1\)](#)
- [Action Research and Seminar](#)
- [Rubric for Action Research \(Assg 2\)](#)
- [Position Paper](#)
- [Rubric for Position Paper](#)

Due Dates

Investigation/Discussion (Participation) Ongoing weeks 1-7

Figure 5.2: Assessment information in the course LMS for the four summative assessments including guidance, visualization of their flow, the assessment rubrics for each assessment and the due dates to submit online within the course LMS (screenshot captured on 11 November 2010)

Documents containing the detailed assessment guidelines and rubrics, and the due dates for each were also provided on this Webpage. Table 5.1 summarizes the key information including what the nature of the activity was; what the students were expected to do; and the due date to submit their artefacts for the four summative assessments as designed by the teacher. In each of these activities, students were assessed based on the rubrics that the teacher had provided as shown in Figure 5.2.

As can be seen in Table 5.1 and as will emerge in more details within the findings, the teacher had purposefully embedded the four ongoing summative assessments and related activities as part of the course design to facilitate meaningful learning and ongoing formative assessment. These ongoing summative assessments, and the interweaved formative assessment including related processes provided opportunities for ongoing monitoring, assessment of evidence of learning and formative feedback. An example of such formative

activity and processes was formative peer-peer review and formative feedback among the students on their artefacts on action research project summative assessment. Another formative process was sharing and clarity of assessment rubrics within the forum for sharing assessment related issues. These formative activities in Case 2 and related processes are further described and illustrated in the findings presented in Section 5.5 and further analyzed in Chapter 6.

Table 5.1: Summary of key information for the four summative assessments in Course 2

The summative assessment	Description of what the students were expected to do	Official start date and the due date of submission
Participation	<ul style="list-style-type: none"> • Active participation and interactive collaboration with peers and the teacher within asynchronous online discussions in the course LMS. 	From 12 July 2010 through 06 September 2010
The annotated bibliography	<ul style="list-style-type: none"> • To develop an annotated bibliography by choosing the topic or focus that aligned with their own learning goals and interest. • The requirement was to include 10-15 previous research articles. • The students were also required to share their bibliography within the class WIKI: 'E-learning research wiki'. This WIKI was not part of the LMS but the teacher had integrated this Web 2.0 tool from an external source. 	The annotated bibliography, 'Assignment 1' overlapped with the participation activity. Started on 19th July 2010 and was due for submission on 27 th September 2010
The action research project	<ul style="list-style-type: none"> • This was an open-ended project in which the students identified and carried out an authentic investigation within real classroom settings. 	Started on 13 th September and was due on 11 October 2010
The position paper	<ul style="list-style-type: none"> • The students were required to write a position paper building on their bibliographic work (assessment activity 2). 	Started on 18 th October and was due 08-November 2010

In this case study, the researcher carried out an in-depth investigation on how the formative processes occurred and their impact on students' learning experiences. The following section focuses on the specific methodological procedures that were utilized in this case study before the findings are presented.

5.4 Methodology

The methodological procedures described in Chapter 3 were applied in gathering and analyzing data in Case 2.

5.4.1 Research participants

There were 18 participants in this course (16 students, 1 teacher, and one participant observer/researcher). Similar to Course 1, the students in this course were mainly continuing graduate professionals in the field of education practicing as teachers and/or working in other educational sectors. It is important to note that three of the key student participants in Case 1 were enrolled in both courses and also consented to become research participants in Case 2.

Table 5.2 presents an overview of the student participants. The student participants differed in gender, age which varied between 31 and over 50 years, work experience which varied between 1 and over 15 years. For the purposes of this study and to ensure participants anonymity, the participating students were identified using pseudonyms as in case 1.

Table 5.2: Overview of Case 2 student participants and their demographic information

Participant	Gender	Age	Place	Education al sector	Experience	Role	Courses taken	Load
A*	female	> 50	NZ	secondary	> 15	Teacher: languages, mathematics	none taking three online courses concurrently	Full-time study (on study leave)
B*	female	31-40	NZ	senior primary	11-15	Administrative role and teaching all (as one is supposed to teach any of subjects offered at that level) than three	2 and taking other two courses concurrently	Full-time (on study leave)
J	female	31-40	Other	primary	2-5	Teacher: ICT applications, ICT and pedagogy, teaching skills	1	Full-time study (on study leave)
K	male	31-40	NZ	secondary	1	Teacher: languages, mathematics and sciences	none	Part-time study; Full- time work
L	female	41-50	NZ	primary	>15	Administrative	1	Part-time study; Full- time work
M	female	21-30	Other	Junior primary	2-5	Teacher: languages	none	Full-time study; No work
G*	female	31-40	NZ	tertiary	2-5	Research consultant	none	Part-time study; Full- time work
N	female	21-30	NZ	primary	1	Teacher: languages, mathematics, sciences	1	Part-time study; Full- time work
P	female	31-40	NZ	learning support	6-10	Teacher: ICT	-	Part-time study; Full- time work
Q	male	31-40	NZ	secondary	6-10	Teacher: health and physical education	1	Part-time study; Full- time work
R	male	31-40	NZ	tertiary	>15	Teacher: Business related	1	Part-time study; Full- time work

Notes:

Participants: Student 1...n (N=11); **Gender:** Either male or female; **Age:** Range in years; **Place:** Country in which participants currently practice; **Educational sector:** Education sector or level they work in which could be junior, primary, senior primary or tertiary; **Experience:** Years of teaching experience (current and previous); **Role:** Current role and/or main teaching subjects; **Courses taken:** Previous online courses taken before course A **Load:** Study mode; ***Student participants in both cases:** Student A, B, G; -: information not provided

Similar to Case 1, the teacher was also key participant. The teacher (with the consent from all the students to be observed) allowed the researcher to access her online classroom in

the role of participant observer. The researcher was therefore a ‘participant observer’ throughout the course period with limited participation to avoid being an interruption to the setting. The teacher also granted permission for use of the course data. This was in addition to responding to interviews at the start and end of the course (initial and end-of-course interviews).

As noted earlier, the teacher had long-term experience in teaching and researching online alongside Teacher A as a close colleague. The teacher has also researched online courses independently for her PhD research. Teacher B had designed and taught various online courses for a period of ten years within which she had developed online pedagogy professional skills over time.

I have been doing this for almost ten years (since 2000)...In this University, I was among the first people to design and teach a course online within the Blackboard as the LMS, we didn’t have StudentNet at that time...From there on, I have been teaching at least one online course every year, sometimes two...I think it was challenging initially because I didn’t not knowing so much when I began, not knowing the best way to approach it... (initial interview with Teacher B)

5.4.2: Data gathered in Case 2 and its analysis

All the 16 students enrolled in this online course agreed to participate during the data gathering process but in varying degrees, as follows: (a) The whole class agreed to be observed throughout the course duration, (b) nine responded to the end of course survey, (c) eleven consented to the use of their contributions within the asynchronous discourse for research purposes, and (d) six participated in the end-of-course interview. The data gathered from the 11 key student participants (those who participated beyond classroom observations) is summarized in Table 5.3. The Table shows the data gathered from primary sources and students participants’ involvement.

Table 5.3: Summary of data gathered from student participants in Case 2

Participants	Learning content within discussion forums	Other forums	End of course interview
A*	+	+	1
B*	+	+	1
J	+	+	1
K	+	-	1
L	+	+	1
M	+	+	-
G*	+	+	1
N	+	+	-
P	+	+	-
Q	+	+	-
R	+	+	-

Notes:

Participants: Student A...n (N=11); **Other forums:** Forum for sharing assessment related issues, and A4 presentations and peer feedback forum; +: available; -: not available; **End of course interview** - recorded for 45 min to 1 hour period; * Enrolled in both Course 1 and 2 (detailed earlier in Chapter 4)

Data was also obtained from the teacher's course design input and contributions to the online discourse. Procedures of how data from each of these sources was analyzed are as described in the methodology chapter (Chapter 3). The input for all the 17 course participants in this course was generally examined as part of online observations for the entire class. However, only content from 12 participants (11 students and the teacher) who had agreed their course contributions to be used for research purposes was selected for detailed analysis. The focus of the detailed analysis was to identify the facets of formative assessment from the archived course discourse and the interview transcripts. Similar to Case 1, this process was guided by cues of the four core themes (target variables/elements) of formative assessment as identified earlier (see Table 3.1, Chapter 3). These core themes were: (a) structure of the assessment, (b) the nature of the assessment activities, (c) shared understanding of learning goals, content and expected outcomes, and (d) ongoing monitoring, assessment of learning and formative feedback.

The initial themes emerging from the analysis of raw data from the various sources revealed various aspects of formative assessment. Most of the identified themes were similar across the sources but the number of coding instances varied across sources. Although the themes were common, they emerged from varying scenarios. For instance, in the online discussion forums, peer-peer feedback emerged as the students articulated their thinking and peers responded to them with converging or divergent viewpoint on topical content, whereas within the action research project presentations and peer-peer feedback forum, peer feedback was in the responses that the individual student received from peers after showcasing their action research project artefact.

Online discussion forums had a total of 48 initial themes that were identified from the coding of the selected content. Table 5.4 shows 30 most coded themes from the online discussion forums organized based on the number of instances coded and theme corresponding cumulative frequency (number of instances coded). The themes did not emerge in any given order during the coding process, they emerged randomly and cumulated over time. In Table 5.4, these themes are arranged in ascending order to indicate theme dominance starting with the highest, a structure that was adopted for the purposes of presenting the findings of this case study.

Table 5.4: The most coded themes from the online discussion forums arranged in descending order with respect to the number of instances coded

Theme ID	Name of the theme	Number. of instances coded
1	Peer feedback as constructive responses from peers upon one's idea/work	116
2	Connecting ideas to broader real-life contexts and experiences	76
3	Recognition of the class as a learning community -common goal and practice, shared repertoire, sense of reciprocity - mutuality	69
4	Connecting ideas to own professional practices and experiences, and work context in relation to ICT integration	64
5	Articulating own developing understanding of content and perspective	54
6	Analyzing the literature critically	48
7	Connecting ideas to the literature	40
8	Awareness and articulation of developing understanding and abilities in relation to practical application of ICT tools	38
9	Recognition of self as source of learning support	38
10	Articulation of how ICT tools can support learning - theirs (sharing their own experiences with the tools) and for their learners	29
11	Trying out and sharing own experiences and products with ICT tools -serves as a learning resource for others	29
12	Recognition of peer feedback - feedback on feedback	28
13	Teacher feedback as responses to students' question and/or teacher feedback prompted by her monitoring the student's progress and achievement	24
14	Recognition of peer learning support	20
15	Recognition of diversity among participant and interest to learn from this diversity	18
16	Cross curriculum effect	16
17	Affective gestures and other experiences outside the class	15
18	Articulation of own perceptions and beliefs	14
19	Articulating own identity and aspiring changing identity individually and as a course community with common professional practice - change agent in relation to ICT integration in schools	12
20	Teacher as a co-participant	12
21	Appreciation of peers' work or contribution	10
22	Reference to previous contribution by self or others - manifest connection among the readings	10
23	Setting expectations and strategies on how to transfer what one is learning to own practice	10
24	Teacher recognition of student initiative to inject new resources within the discourse	9
25	Connecting ideas to own previous educational experiences	8
26	Recognition of teacher feedback	7
27	Setting own learning goals	7
28	Direct question to the teacher or request for support or guidance	6
29	Teacher scaffolding	6
30	Articulating own learning experiences within the online discourse in this course	5
Total number of instances coded for all the themes		838

Notes: These initial themes were overlapping due to the inherent relationships between them and therefore their further categorization and relevant examples are structured within four major themes in Section 5.5.

Figure 5.3 presents the percentage occurrence of the themes presented in Table 5.3. Formative peer feedback was the most coded theme as represented by peer feedback and recognition of peer feedback (Theme IDs 1 and 12 respectively, Table 5.4) with 17.1% (144 instances out of a total of 838 identified instances for the themes). It was followed by connecting ideas to broader real-life contexts and experiences (Theme ID 2, Table 5.4) with 9.1% instances.

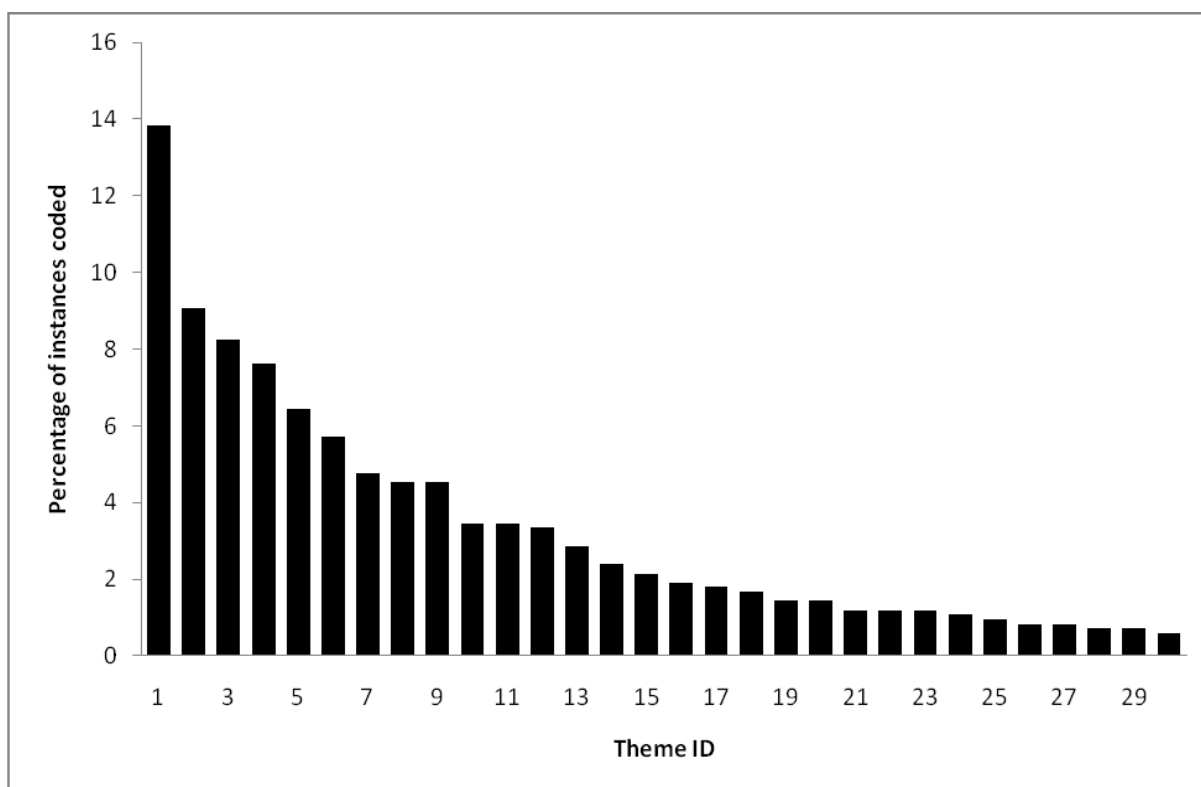


Figure 5.3: Most coded themes from the online discussion forums, derived from Table 5.4

The initial themes were examined for relationships, pattern coded into broader sub-themes and then aggregated with respect to the four broader themes (the core target variables/elements as evidence of formative assessment), which are: (a) assessment structure (b) nature of the assessment activities, (c) shared understanding of learning goals, content and expected outcomes, and (d) ongoing monitoring, assessment and formative feedback.

5.5 The findings of Case 2

Similar to Case 1, the case findings are structured based on these four interrelated core themes and the identified related sub-themes as presented in the following sub-sections.

5.5.1 Assessment structure

This theme explores the evidence emerging from the data with respect to the assessment structure which was based on teacher's approach to assessment in this course. The assessment process was ongoing and entailed variety of assessment activities that were integrated into teaching and learning processes throughout the course duration for both formative and summative assessment purposes. The teacher had structured the assessment activities in such a way that they facilitated ongoing assessment of the expected learning outcomes as defined in the assessment rubrics. The teacher scaffolded learning through the variety of ongoing assessment activities in that current students' performances informed her guidance and support in their learning. The teacher had designed for progressive documentation and sharing of both processes and products from learning and assessment (by being visible to all participants). All the student-created artefacts were shared except for the final activity (position paper) whose sharing was optional. As detailed later in Sections 5.5.4 and Chapter 6, these aspects as part of the assessment structure supported the processes of ongoing monitoring, assessment and provision of formative feedback.

During the initial interview, the teacher recognized formative assessment as a pedagogical strategy for enhancing meaningful online learning and its ongoing assessment. She described how she designed for embedded assessment in this course both for the formative and summative purposes that were integrated within the teaching and learning processes. She also articulated her beliefs and dispositions in relation to active students' involvement in these formative processes as a way of facilitating meaningful engagement and active knowledge construction within a collaborative learning community. In expressing these, she noted:

My definition for formative assessment is anything that allows students to compare what is in their head and compare the way they are perceiving things with other people. For instance, the discussion forums are a chance for them to put the things within this online classroom, to receive the feedback from me and from other people. I also think this is a chance to give themselves feedback, because they can read the opinions of other people and perhaps they may not have posted anything, may be they are lurking, but they are getting internal conversion going inside their own heads...By sharing these ideas that is what I believe is important to them in terms of formative assessment...Another thing that is important to me in this class is that we share everything; everything is public up to the end of the course with the exception of the last paper that they will write, position paper, but I suggest if they want to share those they can...it is shared and I feel that allows back and forth thinking...I am a strong believer about creating our own content, talking about what we have created, deconstructing it by peer reviewing. So it is a sort of constructivist and connectivist approach that I truly believe in (initial interview with Teacher B, July 2010)

The teacher also noted that although collaboration within learning and assessment processes approach had the potential to enrich students' learning experiences, it required her

to be open-minded and take risk with the strategy of shared responsibility through students' active involvement within the learning and formative assessment processes, because, unlike with predefined content and processes, it is not obvious to predict students' actions and experiences in order to respond to their learning needs. She said:

I think these aspects can enrich their learning experiences because they are not learning alone, they are not learning in a vacuum. Most of my teaching now is done in the discussion forum. In the beginning [in the early years of teaching online] this was not the case... it took me a lot of time to be comfortable enough to let it unfold and not to be in charge of everything. I controlled everything but with having to do my teaching within discussion forums, now I no longer know what is going to happen and I am ready to handle whatever comes about... be able to find extra resource and intervene 'just in time' (initial interview with Teacher B, July 2010).

The assessment activities in this course were related to each other as shown in Figure 5.2. The teacher explicitly guided the students on how the assessment activities mapped onto each other in a logical sequence in that one activity informed the next one. For instance, she expected the participation activity to inform all the other three assessment activities and support the student to identify a focus for the bibliography activity, which would then form the basis for their position paper. Based on the online observations and analysis of the archived course discourse, the students recognized how the assessment activities mapped onto each other. The students were able to identify a focus that enabled them to make the expected connections among these activities. For instance, one student (Student M) wrote:

I have created mine [an artefact that was shared as part of 'participation' in the discussion forums] based on my ideas for action research project. I want to see whether teacher's... (Student M, 'Weeks 6 and 7 Discussion -> Trying out the digital tools' in online discussion forum, 17 August 2010)

The interview responses from the 5 of the 6 students (except Student K who was identified as an outlier case as illustrated below) also revealed their positive experiences with respect to how they benefitted from engaging with the interrelated ongoing assessment activities. This was also illustrated by what Student G said:

With the position paper, I had never expected to write on the area that I did... as a topic arose from some of the other readings we did a little bit earlier... so I kind of looked in that area out of interest initially but then used that as my focus for position paper. So it allowed me to explore further in-depth about the content because again a lot of things that we had read (interview with student G, November 2010)

Based on the evidence obtained from online observations and analysis of the archived course discourse, the researcher interpreted Student K as an outlier in this course particularly because of the nature of his/her learning challenges. Mainly, the learning challenges experienced by this student became critical because of missing out from the course in the first 3 weeks due to personal reasons.

I am so sorry for missing out the last 3 weeks' discussion (Student K 'Weeks 2 and 3 Discussion -> A place to share your Web 2.0 investigation and exploration -> Re: A place to share your Web 2.0 investigation and exploration' in online discussion forum, 02 August, 2010)

The teacher had also identified Student K as an outlier case especially because the student did not appear to be confident and committed to learning online despite constant support from the teacher and peers' encouragement. As the teacher noted, the challenges for Student K also appeared to be compounded by personal situations.

I think in regard to that particular[outlier] student who started by saying he/she was uncomfortable in the online environment, and so I started to get in touch with [Student K] about week two when he didn't participate. He/she finally did participate to the minimum amount but he/she said it was very difficult for him/her to share his/her ideas. So I know he/she was not comfortable so I sent him/her several emails saying try this, try that, don't try to put up an original posting just say what you think about what somebody else has said. In the end, he/she went back and he/she posted his/her thought but by that time there was nobody in the discussion that week by that time even though they were able to see he posted and they were very kind and came back and said I agree with. So they did try to pull him/her in but I think more than anything else his/her personal situation was getting in the way. So when he didn't participate we started a dialogue about his/her situation and I wrote him/her emails every two weeks. He/she finally got the extension to complete his/her other assignments from me but he/she finally decided it's not going to happen within the time of extension. So I worked with him/her trying to get him/her what to do but in the end he/she withdrew from the course because he/her couldn't get the work done. So I think it's typically his/her personal issues that were a huge challenge for him/her and not that he/her wasn't capable of learning online (end of course interview with Teacher B, November 2010)

During the end of course interview, the teacher noted that she was satisfied with her assessment approach based on students' learning and assessment outcomes. She noted that, "I think what I expected them to learn was to be able to do and understand from each of these assignments [assessment activities] is what is coming through..." (end of course interview with Teacher B, November 2010).

Five of the 6 students interviewed (that is, except Student K) noted that the variety of ongoing assessment activities supported their learning. This was particularly in relation to how the ongoing assessment both for the formative and summative purposes enabled them to take advantage of their areas of strengths in ways that promoted their engagement and achievements. In expressing this, one student noted:

It was good that it [assessment] was ongoing....it was also good the way it was organized, like the annotated bibliography came before action research and that formed a background, so for me it was okay the way it was...Sharing action research project presentations [artefacts] was useful because I could see others' work implementation, I could see examples of how their students reacted and it was kind of learning from others. I actually saved action research project to refer to them later...Also it helped me to earn a better grade because of having many opportunities to improve, maybe one task is not fitting your learning style but another one might address it, for example maybe you are good at reflection, another one is good at summarizing things, so we have opportunity to develop different skills from many tasks (interview with Student J, November 2010)

The above excerpt clearly illustrates that the students benefited from the interplay and interweave between formative and summative assessment in enhancing their overall achievements in this course. The student recognized that formative processes supported them to enhance their final grade as they had opportunities to receive ongoing formative feedback which supported them to revise their work in the various ongoing assessment activities and close their performance gaps over time. While the students demonstrated willingness to take responsibility for their learning, grading of the ongoing assessment activities for summative purpose was in part a motivator as it also stimulated their commitment to formative processes. This confirmed the teacher's viewpoint as she had expected the students to perceive the ongoing assessment in ways that would support them to enhance both their learning experiences and overall achievement for both formative and summative purposes.

The participation component is practical hand on kind of stuff, with some research articles and theoretical kind of things, this builds into action research planning the other bit is annotated bibliography that maps directly into the position paper. So in reality it is to do assignments as you participate. I think the authentic part in them is probably participation component and action research project because that is where they put things in place and is very relevant to what they are doing in the classroom. But I think all of it is quite authentic to what they are doing because they are getting feedback from their peers... (initial interview with Teacher B, July 2010)

5.5.2 Nature of the assessment activities

This theme explores the evidence of formative assessment in relation to the following related sub-themes: authenticity, learner autonomy and inherent processes including active engagement, interactive collaboration, multidimensional perspectives and reflectivity.

5.5.2.1 Authenticity (complex and contextualized)

The formative assessment activities and associated processes facilitated authenticity as manifested by the aspects of appropriate complexity and contextualization. Based on online observations, the assessment activities were complex to sustain student cognitive engagement over time. These activities also required and/or stimulated the students to interact with real-life contexts. The analysis of the archived course discourse also revealed meaningful engagement with these authentic activities. For instance, the action research project was open-ended and required the students to identify a relevant project within real-classroom contexts. Within this, they had to identify the required resources and accomplish all related sub-tasks including completing formal research ethical procedures. The participation activity also engaged the students cognitively as they analyzed the literature and connected this to their own professional experiences as teachers and other broader real-life contexts. This is revealed in this excerpt:

From my experience and readings in other courses, I would agree with the author. Learning is definitely...I agree that to learn 'with' technology requires a fundamental change in how teachers conceptualize both themselves as teachers and their students as learners. What interested me was the shift in authority between teachers and students...Having not taught for many years, I recognized my own experience with technology in the classroom about halfway down the author's description of the changing use of technology in education (p17) - using technology as a 'productivity tool'...I wonder where others, especially those currently practicing, see themselves? (Student G, 'Week 1 Discussion' in online discussion forum, 13 July 2012)

During the interviews, 5 of the 6 students interviewed (except Student K) expressed their varying experiences which revealed that the assessment activities in this course were complex, challenging cognitively and rewarding in sustaining their engagement in meaningful ways as they interacted with and experienced authentic situations. Their experiences also revealed a sense of overwhelming moments as a result of complexity that characterized these contextualized activities.

This is a course I took because I wanted to learn about ICT, I had to sort of think about a context within. How I could make this fit in my own learning, in my own context really...I wanted to be able to learn what can be applicable in my practice. In particular, for the action research, I did something related to my classroom...it was also problematic...there were a lot of things we needed to do...like we need to do this or that... However, having said that, I was able to use a Web 2.0 tools...clearly proved to be beneficial (interview with Student A, November 2010)

The teacher also acknowledged that the students were able to engage meaningfully with all the assessment activities. Surprisingly, she noted that the students had even exceeded her expectations with the action research project that related to real-life applications. The teacher also acknowledged that some of the procedures were challenging to some students because they had to accomplish their projects within a limited timeframe while also managing other constraints emerging from their chosen project settings. This is how she put it:

I think to a very high degree it [action research] is one of the bits in that class that really allowed them to do something practical, see the problems of it because up to some time is sort of this is a good idea, this might work but when they actually do this themselves, it's real, it's authentic task and I was really very pleased with the quality of work that they did. In fact I thought that they made more of it than I expected, they made it a bigger project even more than I expected. The comments were also very encouraging because they also peer reviewed this. So I think the engagement was very high... (end of course interview with Teacher B, November 2010)

The analysis of the archived course discourse revealed contextualized learning and meaningful reflectivity among the 10 of the 11 student participants. These students constantly articulated how what they were learning was impacting and/or would impact on their own current professional practice. This is evident in the following sample excerpts:

I have enjoyed reading these articles and look forward to learning more about technology (as I want to be able to influence more and more technology into my teaching (Student N, 'Week 1 Discussion' in online discussion forum, 15 July 2010)

This article would be great as a reading for any staff PD [Professional Development] and I have sent it off to my Principal as I think she will agree... (Student B, 'Week 1 Discussion' in online discussion forum, 18 July 2010)

The aspect of learning for transfer also emerged during the interviews. Student B enthusiastically expressed how her learning would impact on her own classroom practices and how she would go beyond to share what she had learnt with colleagues at her school.

I think it will impact on my practice... Like I said earlier one colleague shared something with me around week 1 or week 2... it was a list of things like web tools, she also gave... I copied that and pasted, put it in a word document and I emailed the list to all the teachers in my school. So that was... the most useful thing I have come across as far as something I could use in the classroom with the kids. So I feel I have something to take back to my classroom (interview with Student B, November 2010)

The analysis of the archived course discourse revealed other aspects of contextuality within the collaborative online discourse that entailed active participation in the topical discussion forums. Students were required to engage with others and collaboratively build knowledge within the discussions through sharing and negotiating meaning of the course content that was structured around the relevant topics informed by the existing literature. Their participation in the discussion forums was also assessed for summative purposes based on the analytical rubric as described earlier. Most of the learning in this course emerged through these interactive discussions that supported both collaborative and individual learning as participants articulated their individual perspectives, and compared this with diverse perspectives emerging from others. Within this collaborative discourse, individuals inherently narrated their lived experiences from their own professional practices as teachers and real-life work contexts as a lens for articulating their perspectives. The students were also able to examine these diverse perspectives, identify with peers' experiences, and discern what was meaningful in their own professional practice and contexts. As well, they were able to connect their thinking to other broader contexts. These exchanges between two students reveal such aspects:

I have found the first reading from... to be very thought provoking. I found myself cringing at times as I realized that a great deal of my teaching and assessment is based around the students being able to regurgitate what I have told them. For a while now I have realized this is pointless and that I am rewarding those students who can put my speech and words on their test papers ... Also I am often concerned when my students want to learn about things that are not related to the assessment -sometimes I don't have a single period to spare in order to 'prepare' students for their exams... (Student Q, 'Week 1 Discussion' in online discussion forum, 15 July 2010)

My experience of teaching... is that in order to cover the curriculum within the given time frame (especially for exam classes) there was not a spare moment and we taught topics on rotation... I agree that any departure from the 'timetable' to investigate other topics of interest or as they were raised was limited and felt almost naughty... I am also with you on cringing about my teaching but as many people have indicated here they have a desire to teach with

technology and so perhaps this can be the start of learning how to do this effectively. The skills and knowledge can then be passed to others - the start of the bottom up pressure for change (Student G, 'Week 1 Discussion' in online discussion forum, 16 July 2010)

The online observations and analysis of the archived course discourse also showed that the collaborative discourse also exposed the students from different cultural backgrounds to new perspectives and contexts, which two students recognized as a great shift from their previous experiences but valuable in their learning experiences through exposing them to new possibilities.

Because I have my own way of thinking and when they say it from a different perspectives, there are people from New Zealand for example, they have their own context in their mind, I have my own context in my mind so I see different perspectives, I see similarities and... I learnt many things about New Zealand context from small comments but sometimes, I had to Google that later to see what it means (interview with Student J, November 2010)

Students were also stimulated to explore new possibilities and tools. The following excerpts reveal such an instance which was posted online as peer feedback.

You (Student J) surely give me some confident! You have totally grasped the idea of this non-traditional presentation tool! Good on you! Are you going to make one soon? I would like to see! By the way, I love what you made with... (Student M, 'Weeks 6 and 7 Discussion - >Trying out the digital tools' in online discussion forum, 18, July 2010)

You got me motivated to use prezis with your comments... In the school that I worked we used PowerPoint...but after a while they found this way of presentation kind of boring. So I took one of these presentations and "converted" it to a prezi... Web2.0 tools are so much easy to use, I prefer having students [in own professional practice] create projects, rather than just presenting something I did. Therefore, I can imagine using this tool... This way they can revise the material, but also develop other skills, such as organization, creativity and spatial skills... (Student J, 'Weeks 6 and 7 Discussion -> Trying out the digital tools' in online discussion forum, 19 July 2010)

A total of 5 students out of the 6 interviewed (except Student K) noted that the assessment activities and associated collaborative discourse stimulated them to try out new Web 2.0 tools and explore new possibilities. For instance, one of them noted:

They [the assessment activities] did stimulate me to try out new things and also just seeing what others were doing, this made me realize the potential of various tools and think about how I could apply them in my own situation when I go back to school (interview with Student A, November 2010)

The teacher acknowledged that the students engaged meaningfully within the collaborative online discourse but in varying degrees as it would be expected in a typical classroom. She was also very particular in describing Student K as an outlier case due the nature of his/her challenges in relation to interacting with others online and engaging productively. This is how she put it:

I think you are always going to find that, where some people are more comfortable than others in the online environment. I had one person this time whose was never comfortable in the online environment... and I tried to support him/her from the very beginning saying to him/her you really need to this, this is required, giving him/her strategies how he/she could do

that but things never happened to him/her but I think he/she had some other challenges outside the class, but I think for most part they [students] began to see what is really expected and what is actually useful in terms of talking to one another. Everybody except that one student meaningfully engaged with others... But I also believe that whether or not they are participating a lot, they are probably reading other people postings and that in itself should be counted as a form of participation even if it is not optimum if they don't participate as much. (end of course interview with Teacher B)

Despite the evidenced benefits, the aspects of authenticity in this course were also manifested as a great challenge to Student K who was an outlier due to the nature of his/her learning difficulties which were mainly due to lack of adequate commitment with respect to engaging productively online as illustrated earlier. The difficulties experienced by Student K were also as a result of a learning style that was greatly inclined to face-to-face interactions and this student was not able to flexibly adapt to online learning settings. As the above excerpt reveals, the teacher tried to intervene through providing additional guidance and encouragement through private emails but this did not improve the situation substantially. This was further compounded by family commitments and personal issues that distracted Student K who eventually chose to withdraw from the course due to failure to catch up in accomplishing the course assessment requirements. During the interviews, Student K also acknowledged these factors as a source of the learning difficulties he/she experienced. The learning style of this student did not fit with online learning and a blend with face-to-face interactions was clearly preferred as can be seen in this quote.

Normally students need to compare like what are the assignments and also you know because as we are to attend a real [face-to-face] class we talk to other students, we talk to the teachers so they have clear understanding about everything but for this paper you do not see each other... and you know at the end it is so independent... I am not saying it is not effective, it does not really work for me. It doesn't fit me as I am a visual learner, I learn things from what I see not from what I read or from what other people tell me, or talk to me. So if there was more face-to-face interaction may be it could have helped (interview with Student K, November 2010)

The online observations also revealed that these learning difficulties hindered Student K from engaging productively with others asynchronously and benefiting from the ongoing learning and formative assessment processes. The contributions of Student K within the online discourse were also very limited and were not interactive in that this student constantly appeared to be addressing and/or responding to the teacher in the postings instead of both teacher and peers, for example:

Hi [Teacher B], I just realised I have been using many web 2.0 tools for a long time, but didn't even notice I was doing e-learning.... It does help me... (Student K 'Weeks 2 and 3 Discussion -> A place to share your Web 2.0 investigation and exploration -> Re: A place to share your Web 2.0 investigation and exploration' in online discussion forum, 18 September, 2010)

5.5.2.2 Learner autonomy

The ongoing and authentic assessment activities were characterized by learner autonomy that facilitated multidimensional perspectives through opportunities for choice and flexibility. The students had an opportunity to choose from a variety of relevant areas based on the assessment guidance provided for each assessment activity. For instance, the action research was an open-ended activity in which the students choose diverse authentic topics thus providing for a variety of outcomes as revealed by their artefacts from this activity.

Table 5.5 provides a summary of the specific focus of the authentic projects that the 11 student participants engaged in and showcased for their ‘action research’ summative assessment using the presentation media of their choice. As can be seen here, the learner autonomy enabled students to engage in authentic projects that fitted their learning goals and professional work context. As illustrated within Section 5.5.4, the student also received formative feedback on their artefacts within the ‘action research’ showcase forum.

Table 5.5: Summary of students’ artefacts from the authentic project for their ‘Action research project’ as showcased for summative assessment in ‘Post your action research presentation here’ in Course 2

Student participant	Specific focus of their project	Presentation media
A*	Engaging students to become more motivated in writing through the use of Comic Life	Prezi.com
B*	Does using Picassa computer programme to edit photos enable junior children to produce a better photo?	Prezi.com
J	Using Web 2.0 tools to enhance student engagement and motivation: Considering students’ experiences to improve Web based instructional practices	Voicethread
K	-	-
L	Does a game incentivized online spelling programme improve student motivation?	Prezi.com
M	How do teachers broaden their understanding of teaching topic, adjust their teaching pedagogy, and achieve greater social justice in education?"	Voicethread
G*	Digital native and digital immigrants’ experiences of text-based and multimedia book trailers	Prezi.com
N	Does the use of a Web 2.0 Tool effect the planning of a written piece of work?	MS PowerPoint
P	How do Digital tools help with the engagement and learning of Preschoolers?	Prezi.com
Q	Mobile phones for learning	Prezi.com
R	To determine if students value opportunities to create, share and critique multi-choice questions as has been reported in the literature	Google docs presentations

Note: *Enrolled in both Course 1 and 2 (as detailed in Chapter 4)

During the interviews, 5 students out of 6 students interviewed (except Student K who was an outlier) recognized these opportunities as valuable in supporting them to focus on their

own learning goals and interests. In expressing autonomy as a valuable aspect within the assessment activities, one student noted:

That is a bonus to have it [assessment activities] open but by having it was very widely open and with no suggestions I think it would have been difficult. Just like with children, as well older people would find it difficult without guidance but the good thing with the WIKI is that when we were doing it, it was guided and when we were going through doing reviews and things there were whole lot of examples of different topics other people had done... and I went off from that point...So what I did was part of my personal learning goals and interests... (interview with Student L, November 2010)

As it emerges from the above excerpt, online observations and analysis of the archived course discourse further showed that, although the students valued the opportunities for choice they also recognized the ongoing guidance and examples that Teacher B provided as something that supported them to find their way through the allowed autonomy. Students also recognized that the autonomy supported them to achieve artefacts that could become valuable beyond the course. For instance, one student expressed how she felt about her assessment focus and how it could be valuable in her academic progression after completing the course:

I am currently looking into student perceptions for my annotated bibliography assignment and it seems that not many studies approach the issue of effective practices through students' views...This will probably be the topic of my thesis next year (Student J, 'Weeks 4 and 5 Discussion -> MoE recent released e-learning info' in online discussion forum, 7 August, 2010)

The online observations and analysis of the archived course discourse revealed that autonomy also triggered the students to go beyond the assessment requirements and explore further on things that they felt were meaningful and relevant in their own practice and contexts. Of the 6 participants interviewed, 5 expressed this in varying ways. One of them commented:

This course in a way has stimulated me to explore beyond the assessment activities. In the future, I feel they are things I would like to explore further...So we can integrate that in the curriculum...So this will definitely have impact on my practice...I have already spoken to the principal whether I could get...to use school wide so that I can actually use them ...and if I model that, the other teachers may also take that up (interview with Student L, November 2010)

Another student expressed how the autonomy supported her learning in allowing her focus on something that she was interested to try in her own classroom. She noted that:

Opportunity to choose was good because it gives one an opportunity to have a play with the tools and major on this in your investigation before I go to try it in school and that in itself was really good (interview with Student A, November 2010)

However, the online observations and analysis of archived discourse revealed some instances of contradicting preferences in regard to managing the autonomy among the students within the collaborative discourse. The students had divergent views in relation to the structure of the discussion threads within forums. Some wanted continuous threading on a

particular topic while others wanted to break down the threads based on multiple sub-themes. This was evident within the online discourse as the students exchanged varying views as they sought to reach consensus on the best way the threads should flow. Due to these divergent views, the teacher chose to extend this autonomy by allowing the students to contribute in managing this issue. She suggested to the students that any course participant could initiate a new thread based on what one deemed would serve their viewpoints well at any particular point.

5.5.3 Shared understanding of learning goals, content and expected outcomes

This theme focuses on how shared understanding of learning goals, content and expected outcomes was facilitated through opportunities for dynamic interactivity, negotiation of meaning of the assessment rubrics and teacher's guidance and modelling. These opportunities fostered productive engagement with the ongoing assessment activities and shared role within formative processes.

5.5.3.1 Interactivity

The assessment structure in this course, by being embedded both for the formative and summative purposes, stimulated dynamic interactivity that supported the development of an interactive learning community. Reciprocally, the emergence of an interactive learning community fostered formative processes.

The analysis of the archived course discourse revealed multifaceted interactivity among the students and also between the students and the teacher. The teacher had purposely structured the course in a way that increasingly supported development of an interactive learning community where the course participant (both the teacher and students) were key players. This was meant to foster shared responsibilities within learning and formative assessment processes. During the interviews, 5 students expressed that they experienced a sense of an interactive learning community that supported their learning.

The online forums where you could discuss ideas and talk about things were really good. Often I did not actually contribute but I would read them and it would really spark my ideas and then I would make a comment. That was really valuable, it enhanced deeper thinking and I think it was a very valuable learning experience. It was a quite a close learning community... (interview with Student L, November 2010)

I found it difficult to work out who I was in terms of presenting myself online initially. And then as the course progressed everybody was quite open...we were having similar issues that with time it was more like writing a conversation because one was more comfortable with the people, and knowing how people are going to take what you said... (interview with Student G, November 2010)

As illustrated in the following excerpt, development of an interactive learning community was also evident within the archived course discourse.

Firstly thanks for the wonderful discussions that people have posted in this week's forum. It is hard to correspond to all the wonderful ideas people are expressing. I am certainly reading them. I have just completed reading the second article by Jane Gilbert. I thought I could contribute by raising the issues about the importance... (Student R, 'Knowledge and a community of learning' in online discussion forum, 15 July 2010)

The teacher and the students alike recognized that they had common goals and interests and they valued this community as something that supported them to achieve the learning goals and expected outcomes. They constantly used collective terms (such as we, us, ours) when referring to the class as they articulated their ideas and experiences in ways that suggested that they recognized their shared practice as teachers. These interactions were also characterized by affective gestures and harmonious relations that demonstrated the social bond among the members of this community.

The students acknowledged the cognitive and affective support they received through interacting with other participants within the discourse. They recognized how this interactivity enhanced their skills in relation to the power of learning collaboratively and the encouragement they received from others. For instance, students who shared similar educational background appeared to identify with each other's experiences as they narrated their previous educational experiences comparing with what they were experiencing in this course. This is evident in the threaded excerpts below:

I find the learning attitude very different here, everybody is actively interacting in the classrooms (on-line ones too). I think it has a lot to do with the way that teacher constructs the classes...in [my country] all students have to do is to do what they are told and follow the directions that teachers give them, teachers do not appreciate when students "question" or "doubt" with what they say and that is why...you guys are lucky definitely...I am here learning something different and meaningful... (Student M, 'Weeks 2 and 3 Discussion -> A place to share your Web 2.0 investigation and exploration' in online discussion forum, 23, July 2010)

Don't underestimate yourself [Student M], it seems that...you are able to recognize what was missing from your education and you seem more than willing to get the most out of every opportunity that is given to you. I also have many "complains" about my education back in my country and I realize its weaknesses. However, being able to criticize it means that, despite the hours and hours we've spent to memorize things that did not make much sense, critical thinking skills were developed (even indirectly) (Student J, 'Weeks 2 and 3 Discussion -> A place to share your Web 2.0 investigation and exploration' in online discussion forum, 23 July 2010)

All the things that I've memorized were for taking exams, and I give them all back to my teachers once I passed the exams...It's true that most of the "knowledge" that I've memorized did not make much sense to me... I will keep in mind not to make the same mistakes and offer my students more useful and practical knowledge that they can relate to their lives. Thanks again for the encouragement (Student M, 'Weeks 2 and 3 Discussion -> A place to share your Web 2.0 investigation and exploration' in online discussion forum, 25 July 2010)

The above excerpts also illustrate that, to Student M, this interactivity went beyond supporting her learning in this course to shift her existing beliefs about how learning occurs and perceiving herself as a capable learner irrespective of her background. It also prompted her to reflect upon her own classroom practices.

Some students also interacted with other professionals beyond the online classroom as they accomplished the assessment activities. Their interactions with the others beyond the course community supported them to structure their assessment activities in ways that they would achieve something valuable in real-life contexts. One student expressed this:

I already knew the teacher that I could collaborate with for action research, so I asked her if I could borrow her class. My interaction with her was very useful for the good planning and implementation of the action research project because she gave me information that I didn't know, she knew the students better, she knew the course content. All these things were very useful especially about the students' background...that was the most important because I wanted to address their own needs primarily (interview with Student J, November 2010)

The members of this online learning community also shared with others course participants their perspectives and experiences as they interacted with other contexts outside the online classroom. This form of blended interactions enriched the discourse as participants were able to connect their learning to other broader real-life contexts.

Dynamic interactivity among the participants is also evident within the online discussion forums where course content was being generated collaboratively. The interactivity within these forums was characterized by threaded discussions. Figure 5.4 depicts the nature of interactivity that characterized the threaded discussion forums in this class. The Figure represents one of the threads within a topical discussion forum in which 15 of the 17 course participants including the teacher as a co-participant. This thread had a total of 63 posts where their interactions were back and forth thus a networked structure. The arrow points at the recipient of the message, and the number against the line represents the number of exchanges (posts). The double ended arrow and numbers on both sides of the same line depict that the exchange was back and forth.

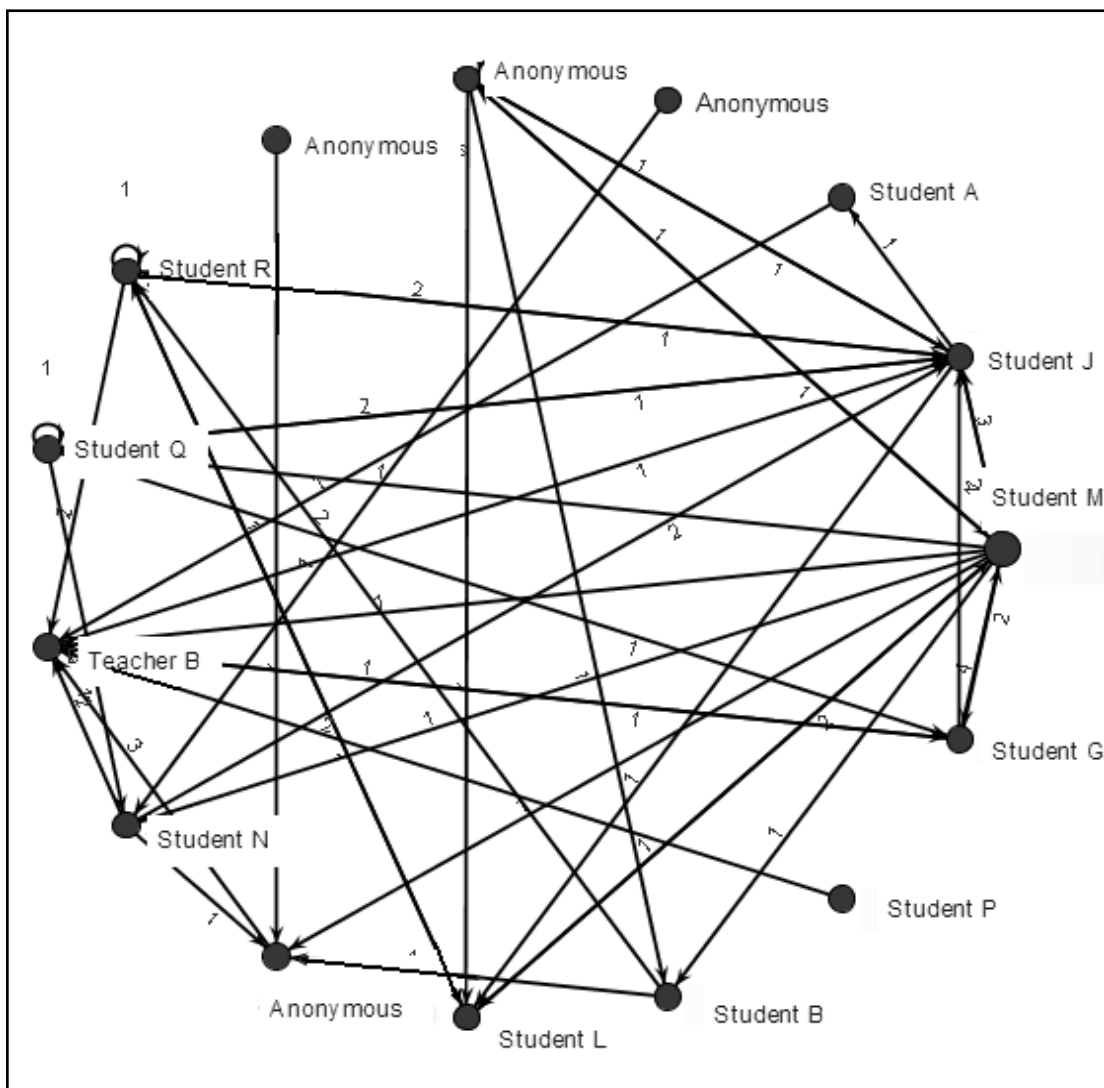


Figure 5.4: Network of interactions in thread ‘Weeks 6 and 7 Discussion -> Trying out the digital tools’ in one of the discussion forums in Course 2 (interactions during the period: 15 August to 03 September 2010)

The online observations and analysis of the archived course discourse further revealed the nature of interactivity as illustrated in Figure 5.4 was characterized by meaningful dialogue among the course participants. The quality of interactivity was particularly enhanced by the ongoing documentation and sharing artefacts supported by teacher’s creative utilization of the LMS. Another observed aspect of interactivity was related to how the participants kept referring back to previous contributions by self and/or peers as they engaged within the online discourse. This was supported by the enabled ongoing documentation and sharing (openness) capabilities provided. This increasingly enhanced students’ interaction with self (self-reflections) as they reviewed responses from others and/or responded to others. Such an instance is illustrated below:

Your [Student Q] comments really made me think - we are so focussed on communication and collaboration using technology as a medium that we may forget that...these are for survival in the 'real' world as opposed to survival in the 'virtual' world that [Student J] was discussing. There has to be a place for both - perhaps this is where blended learning is an ideal approach (Student G, 'Weeks 2 and 3 Discussion -> Discussion of the articles for weeks 2/3 -> Re: Has Technology Changed our youth?' in online discussion forum, 13 July 2010)

During the interviews, the students also expressed that they valued the capability of being able to revisit previous contributions when they wanted to reconstruct, confirm and/or enhance their understanding of the content. One of them noted:

I did, definitely did go back to what others had contributed and reconstructed the reading and I actually went back to a couple of readings that were optional and I had not read but because somebody had said something about them this made me want to go and find out more (interview with Student L, November 2010)

From the outset, the teacher fostered the sense of an interactive learning community and shared responsibility in this course. She recognized herself as a leader and knowledgeable member of this community. The online observation showed that the teacher monitored the discourse to ensure the efficacy of the process but she avoided being a guide on stage to allow the students to discover the power and potential of collaborative discourse. The teacher participated as a co-participant in which she shared her expertise and also valued the ideas, resources and experiences that the students were bringing into the discourse and how this enriched the learning for all. This excerpt illustrates the nature of the teacher's participation within the discussion forums:

It's always nice to find something like this where someone has taken the time to explore and comment about the tools - and allows us to share. And thanks to you too [Student R] for bringing it to our attention. I was struck when I looked at this - that it really is representative of the collaboration that allows us to learn from one another in the Web 2.0 environment - even from people that we have never met. Along those same lines - consider finding some good blogs written by people who are interested in the same things as you - and use those blogs to help you stay informed. Another great example of collective learning! Here are two to get you started...Another blog I like because...He's great at asking questions that should be concerning us! (Teacher B, 'News forum -> Week 3 of our class - focusing on collaboration' in online discussion forum, 25 July 2010)

As it has emerged through the findings so far, one form of interaction fostered other forms of interactivity. This excerpt reveals multifaceted interactivity: with others, content, tools, self (reflectivity) and connectivity to other courses and real-life applications:

Very nice clip [Student L]! I absolutely love this tool, not only for use in the classroom but to make...clips for myself...I can imagine how motivated students might feel using this tool, I remember another example that you shared with us, using student work...Videos can easily be embedded in websites and this makes sharing even simpler...I think that it can be also successfully used in cases that we want to trigger student thinking... This is how I used it last semester with pre-service biology teachers, where they had to... Here is an example I showed them and then they made their own... This tool can really promote constructivist learning, as students have to figure out themselves and answer questions like... (Student J, 'Weeks 6 and 7 Discussion -> Trying out the digital tools' in online discussion forum, 18 August 2010)

Another notable aspect that emerged is the sense of mutual participation as the students were conscious of their social presence even when they didn't participate actively. They would always reassure their 'being there' despite their moments of silence which indicated participation through vicarious observations. This is one of such instances: "I come to this discussion at the end of the week, but it has been interesting to read others takes on the article but it has been interesting to read others takes on the article" (Student B, 'Week 1 Discussion' in online discussion forum, 18, July 2010). Participation through vicarious observations conforms to the teacher viewpoint (as expressed during the interview) that moment of silence while observing others can be considered as way of participation as long as the students equally demonstrate activeness through regular contributions to the collaborative discourse. However, Student K did not benefit from the evident interactivity and its dynamic nature was a source of challenge due to a learning style that did fit well in asynchronous this setting. As earlier illustrated, the participation of Student K within the online course discourse was very limited and not dialogic.

5.5.3.2 Transparency and negotiation of meaning of rubrics

As detailed earlier (in Section 5.3.2), the teacher had provided the students with clear assessment guidance and rubrics at the outset of the course. During the interview, students recognized how the analytical rubrics supported them to accomplish the expected outcomes and monitor their progress. One of them noted:

I followed the rubrics quite clearly. I could use them to assess my progress, I mean guiding me in things like what is required, where am I? It could guide me in the things I needed to cover in terms of setting up the project or designing the activities so that I could do things as required. So in that way they helped me know I am here and am required to be... (interview with Student G, November 2010)

As revealed through the analysis of the archived course discourse and interview responses, students also valued additional opportunities to enhance their understanding of the assessment rubrics. They valued the examples that the teacher had provided and some suggested that they would have appreciated more examples particularly on the action research project activity. During the interview, 5 students varyingly expressed their positive views in relation to how they valued examples:

I remember the teacher recommending some websites [examples]. It was useful in terms of realizing that I am on the right track, we are having the same thinking in our mind. So there were some examples (interview with Student J, November, 2010)

We had examples, and that was great and [Teacher B] had put up a WIKI with previous year examples and that was good and so I was able to go onto those links and have a look at the work that had been done so that I had an idea of what I was going to be doing. Yes, it is always helpful to have some examples (interview with Student A, November 2010)

Of the 6 students interviewed, 5 of them noted that they valued the aspect of being able to see their peers' ongoing work which served as examples and prompted them to reflect on their approach to the assessment activities. They noted:

Initially, I did use the other people's work just to get an idea around it although I had read the matrix [rubrics]. I had read other peoples' work just to have a look at how it looked like in practicality. So seeing what other people were doing, it was like, here is an exemplar. I looked at how a couple of people were going along the way just to see that I was on track, so asking myself, Am I keeping up... (interview with Student L, November 2010)

Sharing my ongoing work and seeing others work prompted me to reflect because sometimes I was reading from others perspectives that I have not thought of. For example, I wanted to use glogster in my action research as an online tool and one of my colleague said okay I used that in my school and we had problems playing videos because of blocked content so I thought of that and I saw that might be a problem for me... (interview with Student J, November 2010)

As revealed during online observations and analysis of the archived course discourse, the students also recognized the value of open forums for sharing assessment related issues/ideas that the teacher had provided. They valued these opportunities as something that greatly enhanced their understanding of the expected outcomes. Through the forums, the students were able to raise their concerns and seek for clarity as well as get exposed to their peers' concerns which also matched with theirs. This is evident in what they expressed during the interviews:

It was very helpful to have what was in that [open] forum, some people used it more than others did... I often read their comments and it ended up answering my questions which was very good because I would think I was wondering about that too. I would ask a question and someone had asked about it as well so it was actually very good because you could see that if there were any new questions, you could see or think I missed that one as well and you could see that other people had not understood that one either and that was a good way of clarifying things (interview with Student L, November 2010)

The students were also able to interact with others within this open forum and share their developing thinking and also receive formative feedback in relation to accomplishing what was expected of them. For instance, this is what one of the students had posted:

I have attached my plan according to the guidelines posted for the action research. I will work with... is what I have done on the right track? I also face the problem that the... Am I on the right track? Is this what others are doing? (Student 2, forum for sharing assessment related issues, 13 September 2010)

The online observations and analysis of the archived discourse revealed that feedback in response to the issues articulated by peers provoked students' thinking and sometimes served their concerns. Figure 5.5 presents sample feedback loop (nature of interactivity within this forum) resulting from Student A seeking for support from Teacher B. Clearly, the question ended up triggering reactions from 3 other students resulting in a total of 15 posts.

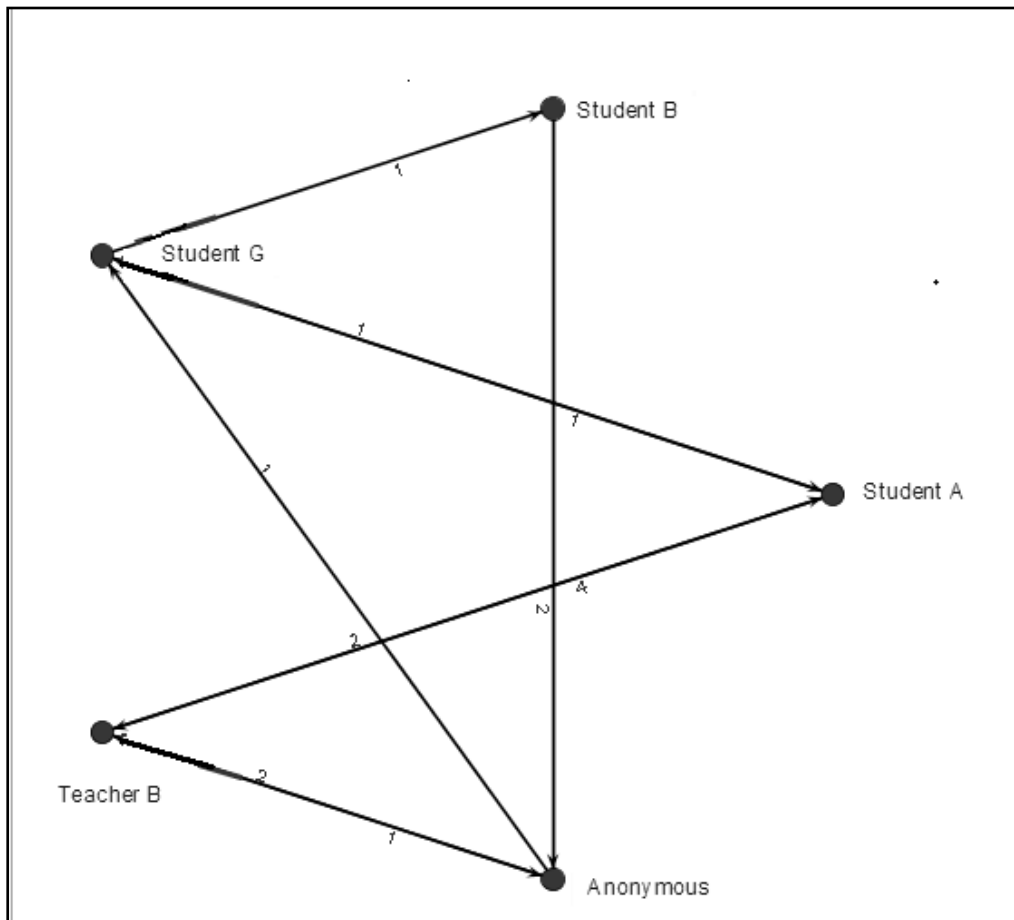


Figure 5.5: Interactions within ‘A place to discuss the research and ideas about your position’ in open forum for sharing meaning of rubrics and other assessment related issues (thread initiated by student 1 while seeking for support from Teacher B on 08 September 2010)

The students’ interview responses indicated that 5 of the 6 students valued the flexibility that the teacher had extended to them in order to accommodate the emerging issues and the autonomy that characterized the assessment activities. For instance, the teacher extended the deadlines for the assessment activities for students who faced issues beyond their control within the action research project. She was also keen to go beyond her initial guidance and follow up to reaffirm the open-ended nature for the action research project.

As the online observations and analysis of the archived course discourse revealed, the teacher provided ongoing guidance to enhance students understanding of expected outcomes in addition to the initial assessment guidance, to support them choose a relevant focus in the assessment activities. For instance, she suggested possible project topics for action research project as well as giving guidance on what she expected from peer-peer feedback on project presentations. The students recognized this aspect as crucial in supporting the achievement of learning goals and expected outcomes. The teacher predominantly scaffolded learning within

the online discussion forums. This was evident in how the teacher guided learning through the ongoing topical online discussion forums.

5.5.4 Ongoing monitoring, assessment and formative feedback (Formative assessment by self, peer and/or teacher)

As already illustrated in Section 5.5.3.1, Course 2 increasingly developed into an interactive online learning community with shared responsibility among the individual learner, peers, and the teacher as the key player within the teaching and learning processes. Additionally, shared responsibility entailed collaboration among the players in ongoing monitoring, assessment of learning, and provision of formative feedback. These formative processes were supported by the ongoing archiving, and sharing of the learning and assessment processes and products as the students engaged with the ongoing summative assessment. The role of self, peer and teacher in these formative processes are described in the ensuing sub-sections.

5.5.4.1 Self assessment

The ongoing assessment activities facilitated various opportunities for self-monitoring, assessment and reflections. The analytical rubrics supported the students to monitor, self-assess and reflect upon their progress. As revealed through online observations and analysis of the archived discourse, opportunities to apply rubrics and enhance understanding of the expected outcomes prompted ongoing self-monitoring and assessment. The analysis of the archived course discourse further showed that self-assessment was also facilitated through collaborations within the discussion forums which supported individual and group reflections as students articulated and deliberated their diverse experiences and multiple perspectives. The formative processes within the ongoing assessment activities also facilitated reflectivity as the students engaged with others sharing their developing understandings and ideas towards accomplishing the assessment activities. Reflectivity was also evident within students' assessment artefacts such as from the action research project where they articulated their journey in the process of achieving the expected outcomes and what they valued as their learning.

The openness of the ongoing assessment processes and products also supported self-reflections as the students were able to compare their thinking and progress with that of peers. Other aspects of self-reflections emerged from the discourse within the forum for sharing action research project artefacts and providing peer-peer formative feedback as the students were able to review and discern from the peers' artefacts what was relevant in their own

contexts. The discourse within this peer-peer formative assessment forum also reveals that the student learned and/or they were stimulated to use new Web 2.0 tools as they interacted with their peers' artefacts.

The students also demonstrated aspects of self-regulation. As it has already emerged, the students were able to identify and obtain the additional resources they required to accomplish the assessment activities. In the course of doing this, they also went beyond the assessment requirements to explore other resources and possibilities that had attracted their interests. They also demonstrated awareness and capability to set their own learning goals and formatively assess how far they achieved these. During the interviews, 5 students varyingly expressed that what they had learned from this course met their learning goals, and they were able to metacognitively connect this to how it would influence their own professional practice. One of them said:

I feel I have learnt, and what I did can actually influence my school in future, I think it will. ... I have had a few discussions about the use of IT in my school and e-learning and particularly Web 2.0 tools. We are very frustrated with the way IT is being used in the school [own professional context]... So I feel you have something to share in regard to making things improve... but through those roles I can bring in ICT through...that is the way I will do it (interview with Student L, November 2010)

The students also demonstrated awareness of their own learning styles and needs as online learners. They articulated what they were experiencing within the online discourse as they engaged with others which also revealed how they were adapting their learning styles to fit well in online settings. This is how some of them expressed it:

There are some wonderful discussions occurring and like you, I have been reading each post. Putting my ideas into a public domain is certainly something I still find challenging. I have to carefully order my thoughts and the scary bit is once they are posted they're up and out there. Sometimes I reluctantly post due to time constraints and my ideas are not well thought out. This register is such a leap from face-to-face where it's okay to be spontaneous and it's so immediate, where you can instantly clarify your ideas on the spot. Having said that, engaging within others online has its benefits and I have to engage... I'm looking forward to getting fully underway (Student A, 'Week 1 discussion' in online discussion forum, 15 July 2010)

I totally agree with your comments regarding spontaneity. Whilst the online discussions are good I do wonder how students who are not confident with writing (a bit like me) feel about communicating in such a fashion. I certainly miss some of the spontaneity you refer to. It takes me a lot more effort to write something than it does to comment in a face-to-face setting. I seldom just sit down and rattle out a posting incase my grammar and spelling are poor. As they say practice makes perfection. Maybe one of the tools we will look at this term will help in this area? (Student R, 'Week 1 discussion' in online discussion forum, 15 July 2010)

5.5.4.2 Peer formative assessment

Based on online observations and analysis of the archived course discourse, the students were actively involved in peer formative assessment through ongoing monitoring, reviewing and

providing formative feedback on their peers' work and/or ideas. As it has already emerged, peer assessment was facilitated through collaborative online discussion forums as the students articulated their understandings within social contexts comparing their perspectives with those of the other participants. Another element of peer feedback emerged through the open discussion forum for sharing assessment related issues.

Peer formative feedback was also evident within the forum for sharing action research artefacts and peer-peer formative assessment. As part of formative assessment processes designed by the teacher, the students reviewed and provided formative feedback on their peers' work. Evident from the analysis of the archived course discourse, the students benefited from peer-peer formative feedback. This provided them with an opportunity to expand their thinking as they composed or received critical comments from their peers. It also exposed them to varying possibilities as they formatively assessed (peer reviewing and providing formative feedback) peers' thinking and/or artefacts. These elements of peer-peer feedback were also characterized by immediacy and interactivity. The excerpts below illustrate peer formative feedback. This was part of feedback that Student N received from 6 peers upon her artefact in action research project within the forum for sharing artefacts.

I think that you have made a good selection of a tool to address the issue of better writing...This is what I encourage my students to do...I agree with [Teacher B] that Kidspiration would be even more suitable ... The only concern I have about this group of learners is that sometimes we assume that they know much more than they actually do. We often call them the 'digital natives', but they are not always confident to use technology. My action research was in...So, I agree that these tools can be easily implemented in the classroom, but we always have to think that students might need more help at the beginning...(Student J, 'Post your action research presentation here' in action research project presentation and peer-peer feedback forum, 26 October 2010)

Your action research has demonstrated well how a Web 2.0 tool can enhance written work. Like Student G I have not used webspiration before. What a superb tool for planning... The pre/post comparison of work with and without the tool is always a good measure of how well the outcome is (or is not). Clearly MacArthur (2006) has done much research in this area...I am looking forward to using Webspiration in my classes in the future. I think time spent initially in the introduction of this tool will have its pay-offs... Webspiration along with [Student G's] suggested...tools I will be investigating. I used Comic Life and found that evoked lots of ideas for writing... (Student A, 'Post your action research presentation here' in action research project presentations and peer-peer forum, 27 October 2010)

During the interviews, students said that through the peer-peer feedback processes they enriched their understanding and that they were prompted to reflect upon their reified artefacts which reveal the benefits of peer-peer formative feedback. They also noted that they had learned something they could transfer to their own professional practice through such reflections and from what they discerned as relevant to them from peers' artefacts.

I gave action research feedback to three people or may be more on what they did and I hoped my feedback would be received not just as compliment but they could also see it as a means of

something else that they might look at. So in giving feedback I felt also I was learning because when I was looking at their presentation I thought ooh, that is another way that I could probably use that tool in my own classroom, so it does have that effect, it has ripple effects (interview with Student A, November 2010)

I think peer assessment and feedback is a valuable tool because the other people are in a similar position to you...The peer feedback did make me think deeply because you actually want to make a comment that is pertinent and relative to what they have said, you actually want, to do that...in some it was somehow easier to do that than others because you tend to have more connections with some of the action research topics or the way they have presented it. So some of the comments were about the presentation and some of the comments were about the content. So I think it was quite good, there was quite a range I think people did it quite well... (interview with Student L, November 2010)

It is important to note that the task of peer-peer formative assessment within the forum for sharing action research project was for formative purposes and therefore it was not allocated marks. During the interview, one student felt that despite the teacher's clear guidance on what was expected of them, lack of accounting the peer-peer formative assessment task as part of their grade in summative assessment might be the reason why some students did not commit themselves fully to providing high quality formative feedback as compared to her experiences in another course (Course 1 in which a similar formative task was assessed summatively). During the end of course interview, the teacher expressed that the students benefited from peer-peer formative assessment processes. The teacher noted that this was manifested as students reflected on their own outcomes as well as broadening their perspectives as they saw others' work and feedback. She also observed that although peer-peer feedback was not considered for grading in terms of allocating it marks, it was a valuable learning experience to the students.

Students sought additional resources beyond what the teacher had provided. They injected new resources into the discourse which enhanced peer-peer formative feedback. Additionally, the students recognized themselves as a source of learning support to each other through directly providing or referring their peers to resources they deemed relevant to their assessment focus. This is evident in the following excerpts:

In my course last semester some of us trialled the use of adobe connect to illustrate how an online synchronous class could be taught. I now have a license for this product and have the ability to run such a session. Is anyone interested in seeing how this product works? I am happy to go online one evening to demonstrate. If you are interested let me know and I will arrange an evening when we can go online and have a play (Student R, 'Weeks 6 and 7 Discussion -> Trying out the digital tools' in online discussion forum, 17 August 2010)

I would like to give it a try, [Student R]! Thanks for the opportunity. Just let me know about the technical requirements and we can arrange a "virtual meeting" (Student J, 'Weeks 6 and 7 Discussion -> Trying out the digital tools' in online discussion forum, 18 August 2010)

As it emerges from the above excerpt, the students also recognized their peers as source of valuable feedback and learning support. This is manifested by how they acknowledged peer learning support and also as they directly prompted for feedback from their peers within the discourse.

As observations and analysis of the archived course discourse revealed, the teacher fostered shared responsibility and valued the peer-peer feedback and the learning support that individual students offered to their peers. She reinforced peer-peer feedback in ways that prompted the class to recognize the relevance of their peer's support.

Thanks for posting this video [Student J]. It struck me that this is similar to Assignment 2 [action research project] - in that the teacher was obviously collecting some data about the project and drawing some conclusions about the activity. It demonstrates a great way to use Animoto in the classroom... I think this video shows that it's possible to use it and involve critical thinking in a real and powerful way (Teacher B, 'Weeks 2 and 3 Discussion - A place to share your Web 2.0 investigation and exploration' in online discussion forum, 25 July 2010)

5.5.4.3 Teacher engagement with formative assessment

The teacher was actively engaged in ongoing monitoring, assessing and providing formative feedback to the students. Online observations and analysis of the archived course discourse showed that the teacher monitored students' progress and provided them with critical feedback as they progressively embarked on achieving the expected outcomes. The excerpt below illustrates teacher's formative feedback to the entire class informed by her monitoring of what the students were sharing within the online discourse in relation to their focus for action research project.

If you are beginning to think about your action research please go to the discussion forum under assignment 2 [the action research project summative assessment activity] in our kete of work and post your ideas for me - and others - to consider and respond to. This assignment is essentially structured for you to be able to... Please continue this discussion in the forum under Assignment 2! I am interested in your ideas about how you would like to conduct this activity (Teacher B, 'News forum - 'Week of 17 October' in online discussion forum, 18 August 2010)

Another evident element of feedback was student-teacher feedback. Data from the various sources showed that the teacher utilized various opportunities to gather feedback (valuable information) from students that were supported by her course structure particularly the online discussion forums. Other aspects that provided the teacher with opportunities to gather valuable feedback from students were the forum for sharing assessment related issues and the mid-course formative activity that was conducted as an online survey. She noted that she gathered feedback from students particularly through monitoring the discourse within the online discussion forums.

One of the things that I try every time I post anything is that I really like to say to myself: have I anticipated the questions they might have, have I made it clear enough. One of the things I think being an online teacher does for you is that it makes you a very careful communicator because you are not there with your body language, tone or voice and facial expression and all you have is your words and so I start by saying to myself does this say what I wanted to say, can it be in a different way than I intended. So what I always say in the forums, emails and instant messaging let me know where I have not been clear enough and where I didn't anticipate... in the beginning I felt they were more things I needed to comment on but I found that becomes less and less overtime...they [students] have taken over that job and began to be a learning community of their own so I get heaps of feedback through those forums (end of course interview with Teacher B, November 2010)

Both online observations and analysis of the archived course discourse revealed that the students recognized and valued teacher's feedback as timely and formatively useful. They also valued the openness of teacher's feedback to others in that this sometimes addressed their concerns. Students also valued the additional opportunities to seek feedback through private emails to the teacher. These positive experiences were also reported by the students during the interviews. In expressing this, some of them commented:

I found that every time that I needed something the teacher was there to answer. But sometimes my questions were not clear enough for her to understand what I wrote... Sometimes I got very frustrated and I tried to ask the question right in order to have the right answer that I expect...I also found the teacher feedback to others useful to me because sometimes there were things I had not thought about yet or things I wanted to know I didn't know how to pose the question and so I sometimes found others feedback relevant to me... when I wanted to ask [Teacher B] something I sent her an email... (interview with Student J, November 2010)

Teacher's feedback was very timely, like she got back to us with our marks from assignments particular really quickly...that was very helpful, she marked things against the rubrics, so one could sort of get back to it and it had the points that one had achieved and so that was great and she entered the comments at the bottom on what I could do better... So, I found her feedback very good, she emailed you (interview with Student B, November 2010)

Online observations and analysis of the archived course discourse also showed that students expected and valued feedback from the teacher. This was manifested by instances of directly asking the teacher some questions or prompting for further clarity and/or support.

Thank you, [Student M], for the support and for the suggestion of using this medium for planning our own projects - I think had thought of it more as a 'presentation to others too!' but I see it can have other uses now...Is the action research project you have described for this course? I thought we had to design a lesson involving technology, teach that lesson and then evaluate it? Perhaps there are more interpretations than this - if there are, I have some other ideas... [Teacher B] can you give us some clarification on this? (Student G, 'Weeks 6 and 7 Discussion -> Trying out the digital tools' in online discussion forum, 17 August 2010)

5.6 Summary of Case 2 findings

This case focused on exploring the evidence of formative assessment as part of the embedded assessment in Course 2, and the meanings that the course participants derived from this. Assessment structure in this course was one of the key elements that facilitated effective

formative assessment. The embedded assessment in this course was characterized by variety of ongoing assessment activities (both for formative and summative purposes) that provided a structure for learning, and sustaining students' active and meaningful engagement synergistically with the capability of ongoing documentation and sharing (openness/publicity) of assessment processes and products. This enhanced the processes of ongoing monitoring, assessment of learning, and provision of formative feedback as a shared responsibility among the students and the teacher. In these ways, the ongoing assessment provided opportunities for responsive learning support and learning scaffold that enabled the students to enhance their understandings and achievements over time.

The interplay and interweave between formative and summative assessment as a core aspect of the assessment structure particularly supported the students to enhance their overall achievement through supporting them enhance their understandings as they received ongoing formative feedback. This in turn provided them with opportunities to close their performance gaps over time and enhance their grade for summative purposes, as well as develop competencies that were transferable to their own professional practice and contexts. Although the students demonstrated intrinsic responsibility for their learning, grading of formative assessment for summative purposes partly motivated them and stimulated their commitment to ongoing formative processes. Inherent within the assessment structure was that the teacher's pedagogical beliefs influenced her approach to teaching and assessment, and what she valued in relation to learning and formative assessment processes.

The authenticity within the various assessment activities was another key element that supported cognitive engagement and contextual learning. The ongoing assessment activities were authentic and complex to sustain student cognitive engagement as well as requiring interaction with real-life contexts. Moreover, the assessment activities stimulated the students to connect their learning to real-life contexts, and apply their existing knowledge and experiences. This was evident within their individual assessment processes and products as well as the collaborative online discourse where students inherently narrated their lived experiences as both professionals and learners. Through these aspects, the students were exposed to diverse perspectives and contexts that engaged them in critical thinking and reflective learning, which in turn expanded opportunities for critical and contextualized formative feedback. Exposure to diverse perspectives also prompted the students to think in new ways, changing their identity as more knowledgeable professionals and improving their ability to transfer what they were learning to their own professional practice and contexts.

Learner autonomy also enhanced authenticity through the opportunities for choice and flexibility as the students were able to focus on their own areas of interests and contextual needs. This resulted in diversity of approaches and outcomes evident in the students' artefacts. The emerging multidimensional perspectives exposed the students to diverse possibilities and tools that deepened their understandings and ability to apply their learning to real-life contexts. Notable from the findings were the aspects of self-regulation among the students that was partly stimulated by the authentic tasks which enhanced students' ability to take ownership of their learning and engage in meaningful learning. Students also benefited beyond developing the content knowledge to learning other important skills such as collaborative knowledge building, information searching and organization, and learning how to learn online.

Despite the benefits emerging from authenticity and learner autonomy, the inherent complexity was also manifested as a source of cognitive challenge to some students. This was demonstrated by their divergent experiences that were both rewarding as well as overwhelming to some students as they engaged with the ongoing and authentic assessment activities. As illustrated in the previous section, there was an outlier case of Student K who was unable to overcome the encountered learning challenges due to lack of confidence; missing out in the course in the first three week; and failure to adapt own learning style to fit in online settings despite encouragement and support from both the teacher and peers. Family commitments and personal issues also compounded the challenges experienced by this particular student. These factors hindered Student K from engaging productively with others online, as well as participating actively within the collaborative learning and formative assessment processes. This indicates that failure for students to adapt their learning style to fit asynchronous setting can reduce or hinder the benefit of online formative assessment.

The ongoing shared understanding of learning goals and expected outcomes was another key element of formative assessment in this course. Clear assessment guidance and analytical rubrics from the outset of the course played a key role in supporting the students to monitor and assess their own progress and achievement in relation to the expected outcomes as well as in supporting them in formatively assessing peers' learning. Use of examples also enhanced understanding of expected outcomes. In addition to expressing the importance of the examples provided by teacher in assessment guidance and analytical rubrics, students recognized and utilized peers' ongoing work as examples. The teacher role in providing ongoing expert guidance was core to enhancing students' understanding of the expected

outcomes. The students in this course also valued the guidance and flexibility that the teacher provided within which shared meanings were negotiated and developed.

The students also benefited from the open forum for sharing assessment related issues as this provided them with opportunities to clarify assessment rubrics and other emerging concerns as they engaged with the assessment activities. Through this forum, they were able to prompt formative feedback from peers and the teacher. The commonality of issues and concerns, and the openness that characterized learning and assessment processes and products allowed common feedback that concurrently addressed shared need. The students also identified with peers experiencing similar challenges that emerged as a form of peer-peer encouragement and in turn enhanced their confidence.

Self, peer, and teacher engagement with formative assessment were evident in this course as core strategies for online formative assessment. As well, the overlap and interweave between the formative and summative assessment as described earlier was another evident core strategy. Self-assessment was supported by variety of aspects including analytical rubrics, online discussion forums, forum for sharing assessment related issues, and peer-peer formative feedback on students' artefacts. Self-assessment was manifested by how the students monitored, assessed and reflected on their own progress and achievements. The assessment fostered reflective and meaningful learning as the students made connections to real-life applications within their own practices and contexts, and other broader contexts. Emerging from the self-assessment processes were aspects of self-regulation and metacognition. The students demonstrated self-regulation, which was manifested by their ability to identify additional resources to support them accomplish the assessment activities, directly prompting for support from others, thus following their learning goals and interests beyond the assessment requirements. Metacognition was evident as the students demonstrated awareness of their learning goals, articulated their own learning, recognised self as source of learning support, awareness of own learning needs as online learners, and in setting strategies to meet their needs.

Asynchronous collaboration within the topical discussion forums was a key component that facilitated peer formative assessment where students shared and negotiated their understanding of content with peers which enhanced their understanding as they compared and interpreted the emerging divergent and multiple perspectives. The open forum for sharing assessment related issues and action research project also facilitated peer formative assessment as the students assessed their peer's thinking and provided peer feedback. This also supported contextual learning as the students were able to discern what

was relevant to their context. Moreover, peer-peer review and formative feedback on students' artefacts promoted reflective thinking as the students sought to justify their feedback to peers. Similarly, as feedback recipient, students had the opportunities to justify their position, ideas, and/or decisions as well as acknowledge peer feedback which contributed to their learning.

Teacher engagement with formative assessment was also evident in guiding and fostering the collaborative and interactive processes within shared responsibilities with students in monitoring, assessing and providing formative feedback. Alongside this, the teacher also played the role of a subject matter expert and experienced facilitator. Students recognized teacher's ongoing feedback and guidance as timely, and a formatively useful learning scaffold. The formative activities and associated processes provided the teacher with multiple opportunities to gather valuable information from the student. This supported the teacher to provide feedback that was responsive to students needs. The interactivity within these strategies prompted the teacher to reflect on students' progress and achievements.

Similar to Case1, the synergy emerging from the interrelated strategies of formative assessment fostered the development of an interactive learning community without the need for teacher to anticipate the dynamics of interactivity among the community members. Instead, it required her to be vigilant and open-minded in order to responsively meet the emerging learning needs among the students. There was no need to predict the students' actions, comments, responses and/or questions in order to provide formative feedback as the participants had progressively developed the willingness to make their thinking visible to others. These processes exemplify formative assessment as a collaborative pedagogical strategy that promoted valuable learning experiences and outcomes thus supporting the teacher to *design for meaningful learning* as opposed to *designing learning*. This implies that learning resources and opportunities were shaped by the learning experiences as opposed to prescribed structures and content.

It is now evident that the findings of Case 2 confirms those from Case 1 in relation to how innovative integration of formative assessment promoted meaningful learning in both online courses within the context of ICT education for continuing professionals. However, there were some varied aspects with respect to specific techniques and scenarios that contributed the effectiveness, and lessons learnt from the emerging issues. As well, both case studies reveal a number of contextual similarities but also a few differences exist. An in depth analysis of the findings of both cases is presented in the following chapter through a cross-

case analysis that seeks to achieve holistic understandings with respect to the phenomenon under study.

Chapter 6

6.0 Cross-case analysis

6.1 Introduction

This chapter presents a detailed cross-case analysis of Cases 1 and 2 as part of this research which is a collective case study of two individual courses as reported in Chapters 4 and 5. This research sought to illustrate how integration of formative assessment as part of embedded assessment can promote meaningful online learning in ICT education for continuing teachers. The chapter starts by providing an overview of the focus of this research and the adopted multi-case design to refresh the reader with a general description of this study in relation to the phenomena under investigation in the two online courses. The chapter proceeds to give a detailed account of the rationale behind the cross-case analysis and the applied methodological procedures in analyzing and synthesizing the findings of both case studies. This is followed by sections that present the key research findings that are structured around the themes that underlie the key research question being answered in this study.

6.2 An overview of integration of formative assessment in the two online courses

The focus of this research was how integration of formative assessment in online courses can enhance learning experiences in ICT education for continuing teachers and other educational professionals. This research was designed as a multi-case study of two online courses that were offered in a New Zealand University during the academic year 2010. The two case studies were postgraduate courses with the overall goal of supporting students to develop knowledge and skills in educational ICT that were transferable to their own professional practice and contexts as continuing teachers and/or educational professionals. The key objective was therefore to support students in these courses to develop deep understandings of the course content within a supportive learning community and progressively become cognizant of their own learning in ways that would support them apply their learning in real-life professional contexts.

In designing their respective course, both teachers purposefully aimed to create adequate opportunities to support students connect relevant theories, research, and workplace experiences to application of e-learning in face-to-face, blended, and online contexts. Both teachers recognized the importance of adopting a learner and assessment-centred focus, and therefore they incorporated formative assessment as part of their course design with the aim to

achieve such a focus. Both teachers offered a variety of ongoing assessment activities that were embedded within teaching and learning processes for both formative and summative assessment purposes. This enabled opportunities for assessing learning in relation to the course learning goals and expected learning outcomes. The application of online formative assessment (as part of the embedded assessment) in each course was therefore aimed at facilitating active learners' engagement with meaningful learning experiences and creating adequate opportunities for ongoing monitoring, assessment, and formative feedback.

Data obtained from each of the two courses were analyzed and reported as individual case findings as presented in the two preceding chapters. Subsequently, the individual cases' findings were integrated through analysis across the cases (as reported through Section 6.4) in order to achieve holistic understandings of the phenomena under study and answer the key question in this study in relation to how online formative assessment can enhance online learning in ICT education for teachers. This study applied a multi-case research design in order to facilitate a cross-case analysis for purposes of achieving more holistic and rich understandings.

6.3 Rationale for cross-case analysis and the applied methodological procedures

As Stake (2006, pp. 39-41) suggested, cross-case analysis is used to interpret, synthesize and report the most important findings from individual cases. Underpinned by the common aspects across the two case studies, the cross-case analysis sought to achieve holistic and rich understanding of the phenomenon under investigation guided by the key concepts of the research sub-questions. The cross-case analysis in this research therefore focused on the findings with both rich evidence and those that were in harmony with the research questions. Framed within the multiple-case study design in which the individual case analysis was guided by the similar propositions, the cross-case analysis was based on replication logic (Yin, 2009, pp. 53-56). That is, the purpose for a collective case study was to converge the findings in order to confirm similar results (and/or disconfirm contrasting results) for predictable reasons. These were aimed at achieving holistic and in-depth understandings of the phenomenon under investigation, and explicate contextual influences in relation to whether the outcome of the study from the findings of both cases could be associated with varying contextual (situational) conditions. This rationale is also consistent with Stake (2006) who noted that the multiple-case study or "multicase study is not a design for comparing cases, [instead], the cases studied are a selected group of instances chosen for better understanding of the quintain [where quintain refers to the phenomenon being studied as it

occurs within a specific case]” (Stake, 2006, p. 83). Stake argued that giving much emphasis to attributes of comparison can be “a competitor to probing study of a case... it obscures the situationality and complex interaction of case knowledge” (2006, p. 83). This notwithstanding, Stake (2006) also clarified that, illuminating both similarities (convergences) and differences (divergences) across cases can contribute in promoting readers’ understanding and in making the research findings more persuasive. This in turn, increases the possibility for analytical generalization (Stake, 2006, pp. 88-90). Following these viewpoints, the cross-case analysis in this study aimed at achieving rich understandings, and therefore considered elucidation of both converging and diverging findings of both cases.

The cross-case analysis involved integration of key assertions from the individual case findings and clarification of specific contextual influences, followed by exploration of their multifaceted conceptual convergences and divergences. Therefore, the goal was to establish rich chain of evidence in order to inform holistic understanding of phenomenon as opposed to building a chronological comparison of discrete elements/variables. This was helpful in discerning the relevant variables or themes (within a context) that can foster (or curtail) effective application of online formative assessment as a way of enhancing meaningful ICT-related professional development for teachers within online contexts.

To facilitate the cross-case analysis, the individual case findings were re-examined using theme-based analytical technique proposed by Stake (2006) and Yin (2009). These authors recommend use of theme-based (descriptive and/or theoretical) analysis technique within individual case analysis in order to facilitate basis for effective cross-case analysis. According to Yin, the descriptive themes can be based on key concepts that are central to the research question, while the theoretical themes derived from the literature are also helpful in conceptual interpretations of the findings in order to achieve broader meanings that embody the existing body of knowledge.

The use of descriptive theme-based style in analyzing data and reporting the individual cases’ findings was useful during the cross-case analysis especially in the process of discerning the patterns of key assertions emerging from the findings within individual cases. This process supported the researcher to systematically sift through the findings while paying attention to situational influences within individual cases in order to preserve the particularity of the individual case context. This is pertinent in enhancing the richness of a multi-case study research (Stake, 2006; Yin, 2009). The descriptive themes were derived from coding of the raw data into relevant categories within individual cases, for instance, the initial themes coded are presented in Tables 4.3 and 4.4 (Case 1) and Table 5.3 (Case 2) in Chapters 4 and 5

respectively. These initial themes were subsequently aggregated into broader themes and sub-themes that were used to structure the findings within the individual cases. The individual cases' findings and related discussions were subsequently re-examined to discern the key assertions emerging from the findings. At this second-level of analysis, the key assertions were identified with respect to the multi-case themes. The multi-case themes in this context were the four key themes that correspond to the research sub-questions that this study sought to answer as introduced in Section 1.2. The following section presents the relevant findings of both cases guided by the research sub-questions.

6.4 The key research findings

6.4.1 In what ways does online formative assessment support meaningful learning?

Meaningful learning in the context of this study was manifested through the following learning experiences: active cognitive engagement, contextual learning, interactive and collaborative learning communities, multidimensional perspectives, reflective learning, and self-regulation. This conceptualization of meaningful learning was informed by the reviewed literature and related theoretical perspectives as presented in Chapter 2. This guiding sub-question attempted to establish ways in which integration of online formative assessment in Course 1 and Course 2 (Cases 1 and 2 respectively) promoted the meaningful learning. Meaningful learning experiences that emerged in both courses as re-examined and illustrated through this section.

The variety of embedded summative and formative assessment activities in both cases 1 and 2 were appropriately authentic to sustain students' active and meaningful engagement. The ongoing and interweaved summative and formative assessment activities served both formative and summative assessment purposes. As earlier described and illustrated in Chapters 4 and 5, the assessment activities by being ongoing and interweaving means that they were offered at the outset of the course and were distributed throughout the course such that they mapped onto each other and/or build up onto each other (e.g. as shown in Figure 5.2). The triangulated evidence obtained from various sources (including online observations, analysis of the archived course discourse, and interviews with the students and both teachers) showed that the interweave among the assessment activities also supported the students to use the feedback they received to revise their work, and enhance their understandings and achievement over time for both formative and summative purposes.

The online observations and the analysis of the archived course discourse revealed that the assessment activities were complex in ways that sustained students' engagement in critical

inquiry in that they required them to define sub-tasks, procedures and identify relevant resources and engage in problem solving in order to successfully accomplish the tasks. This sustained meaningful engagement and supported them to achieve their learning goals and expected outcomes. The complexity within these authentic assessment activities was demonstrated by students' higher-order cognitive engagement, and their awareness of this also emerged during the interviews at the end of the course.

There were the harder things like investigation that I knew I needed to know how to do...I had to do all the assignments [the various formative assessment activities] but I had expected this kind of higher order thinking at this level of postgraduate (interview with Student B, Case 1, November 2010)

I had to sort of think about a context within which to fit my own learning...In particular, for the action research project [one of the assessment activities], I did something related to my classroom...it was also problematic...there were a lot things we needed to do...However...it clearly proved to be beneficial (interview with Student A, Case 2, November 2010)

The online observations and analysis of the archived course discourse showed that formative assessment activities and associated processes such as peer-peer formative feedback facilitated contextualized learning as students shared their artefacts and received formative feedback which in turn prompted them to connect their learning to their own real-life and other broader contexts. The sharing of the artefacts was fostered by opportunities for ongoing documentation and openness/publicity. The artefacts that emerged in both courses included:

- Intermediate products and their ongoing documentation as a process – this included course participants' (students and teachers) contributions (as initial ideas and/or feedback to others) within the asynchronous topical discussion forums.
- The individual student ongoing assessment work in the authentic assessment activities that was public to all course participants
- The shared end-products from the assessment activities, for instance, through students presenting their assessment work (processes and outcomes) that emerged from their project. This also included the related received feedback from peers.

Engagement with authentic activities, and reification of processes and products within the discourse facilitated valuable learning experiences that were meaningful in real-life contexts. This in turn supported the students to achieve meaningful outcomes. Students' engagement with these ongoing assessment activities while interacting with others facilitated development of an authentic and safe learning environment to explore new possibilities and/or tools. Contextualized learning was also evident as manifested by how the students were interested in what they could transfer to their own practice in the process of engaging in the

variety of summative and formative assessment activities; and sharing their artefacts with peers.

They [the assessment activities] did stimulate me to try new things and also just seeing what others were doing, this made me realize the potential of various tools and think about how I could apply them in my own situation when I go back to my school (interview with Student A, Case 2, November 2010)

Contextualized learning promoted meaningful reflectivity among students in ways that enhanced their abilities with respect to transferability of their learning into their own professional practice and contexts. As the students engaged with assessment activities and formative assessment processes within a social context, they were stimulated and facilitated to connect and share their lived experiences both as professionals and learners leading to critical reflections upon their individual experiences as well as those of peers. This in turn prompted them to discern what was relevant to their own practice and contexts. Moreover, the authentic formative and summative assessment activities required and stimulated the students to apply higher-order thinking skills in order to achieve the expected outcomes and their learning goals; and this provided them with opportunities to apply their existing knowledge and experiences as knowledgeable professionals, thus fostering contextualized learning.

Learner autonomy within the authentic assessment activities also fostered contextual learning. Through the online observations and analysis of the archived course it became evident that opportunities for choice and flexibility prompted students' engagement with tasks/topics that fitted well with their own learning goals and contextual needs. In both cases, the students recognized and valued those opportunities:

Being able to choose my assignment project topic helped me to be able to investigate an area that was of concern to us [my school] and this was very worthwhile (interview with Student A, Case 1, November 2010)

It was a bonus to have it [assessment activities] open...So what I did was part of my personal learning goals and interests...I was actually very tempted to do my thesis on it... (interview with Student L, Case 2, November 2010)

The evidence obtained from various sources showed that the authentic assessment activities and opportunities to choose from alternative tasks/topics allowed the students to accomplish alternative tasks resulting to divergent approaches and range of solutions and/or products. This provided opportunities for multiple sources of evidence of learning. Students were exposed to diverse resources, perspectives, possibilities, and tools as they engaged with the authentic learning and assessment activities coupled with opportunities for choice and flexibility; and ongoing sharing their artefacts. The emerging multidimensional perspectives supported students to learn more meaningfully through providing them with opportunities to learn from varying peers' ideas and artefacts. As illustrated within Chapters 4 and 5, the

students had variety of perspectives that appeared to be influenced by their existing professional experiences and exposure to educational ICT in context of practice as teachers.

Formative assessment in this study was also characterized by interactive collaborations. Based on online observations and analysis of the archived course discourse, the interactive collaboration emerging through the formative assessment processes in the two courses was purposefully encouraged from the outset by both teachers. These teachers explicitly encouraged and emphasized the value of learning collaboratively with others (teacher and peers) as co-participants within the asynchronous discourse.

My own little patch of 'e-understanding' is just one bit of the landscape so I will be very much facilitator rather than sage - and I expect we will all learn a great deal from each other as we share experiences, questions and conversations...(Teacher A, 'Introduction Forum' in online discussion forum, Case 1, 2 March 2010)

It's always nice to find something like this where someone has taken the time to explore and comment about the tools - and allows us to share. And thanks to you too...for bringing it to our attention. I was struck when I looked at this - that it really is representative of the collaboration that allows us to learn from one another... (Teacher B, 'Weeks 2 and 3 Discussion -> A place to share your Web 2.0 investigation and exploration -> Re: A place to share your Web 2.0 investigation and exploration' in online discussion forum, Case 2, 25 July 2010)

The online observations further showed that the students in both courses actively collaborated with other course participants by sharing their thinking and negotiating meanings of content and expected outcomes, while also receiving and/or giving feedback to their peers. Through peer and teacher formative feedback, students were also able to enhance their understanding of content and close their performance gaps (the gap between student's current performance and desired performance in relation to the expected learning outcomes). The analysis of the archived course discourse revealed that opportunities to evaluate the emerging multiple and diverse perspectives stimulated the students to discern what was relevant in their own contexts. This was useful in enriching their individual perspectives and supporting them to build new interpretive frameworks, hence new knowledge. It became evident that these collaborations supported both individual and group learning.

Through the discussions, I was able to gain new insights from different viewpoints that came from my classmates. When different participants included their job experiences and contextual issues, I found this useful to my understanding... (interview with Student C, Case 1, November 2010)

... It is great to have some tools that others have trialled and liked. I was looking for material over the weekend and found this site. I think it also has some cool places to examine (but have not looked at all of them yet)...Student R, 'Week 2 and 3 Discussion -> A place to share your Web 2.0 investigation and exploration' in online discussion forums, Case 2, 19 July 2010)

I shared this site early on, but thought you may want to be reminded of it - it is excellent for everyone as it has good links within it.. and my kids in my class [own professional practice] have found it a good source...I have enjoyed the playing around this week - podcasting is

something I can see the use of but it has always felt over my head so was good to try that out [in this course]...Has anyone else use podcasting for teaching/study purposes?(Student B, 'Week 6 and 7 Discussion-> cool tools for schools' in online discussion forum, Case 2, 20 August 2010)

The online observations and analysis of the archived course discourse revealed that formative assessment fostered meaningful reflectivity that were manifested through three interrelated sub-processes of reflection; namely, students were able to return to experiences, attend to feelings, and re-evaluate their experiences. As illustrated in the following excerpts, students' reflections were constantly characterized by the three inherent processes. They constantly returned to their experiences by publicly debriefing their progress in engaging with the ongoing summative and formative assessment activities, and articulating their developing understandings of content and abilities. Students also inherently narrated their lived experiences as both learners and professionals within which they used individualized phrases or metaphors as lenses to articulate their feelings. Students were also able to re-evaluate their own and/or peers' learning experiences through articulating their changing way of thinking, perceptions and abilities which provided evidence that they were integrating new knowledge into their conceptual framework. Moreover, the students' learning experiences within these courses stimulated them to critically reflect in new ways in relation to their own experiences and professional practices and other broader real-life contexts. The following excerpts illustrate the nature of reflective processes emerging from students in both cases.

I'm really struggling at the moment - not with the course - I'm really enjoying the readings but in the back of my mind I have a small annoying thing - kind of like a fly buzzing round - called "reality" **[returning to experiences]**...I think most teachers are shrouded by day-to-day...BUT when I take myself from my comfy armchair to a less comfortable stool inside a classroom I think "how is this going to work in reality?" **[attending to feelings]**...I see myself finishing the course with a few more tools in my toolkit that may help engage my students better...within my practice... **[re-evaluating the experiences]** (Student F, online reflective journal, Case 1, 18 May 2010)

I have found the first reading...to be very thought provoking **[returning to experiences]**. I found myself cringing at times as I realized that a great deal of my teaching and assessment is based around the students being able to regurgitate what I have told them **[attending to feelings]**. For a while now I have realized this is pointless and that I am rewarding those students who can put my speech and words on their test papers **[re-evaluating the experiences]**... (Student Q, 'Week 1 Discussion' in online discussion forum, Case 2, 15 July 2010)

As illustrated in the above sample excerpts, it was evident that the nature of students' reflective processes manifested meaningful reflectivity as they re-evaluated their learning experiences within the context of their own professional practices.

The evident meaningful reflectivity also prompted the students to self-regulate their learning. The analysis of the archived course discourse showed that the ongoing formative

feedback supported students to develop self-regulated dispositions and productively engage in ways that stimulated deep inquiry beyond the assessment requirements in pursuit of their own goals and interests. This was also evident in the interview responses, for instance, one student noted that, “this course in a way has stimulated me to explore beyond the assessment activities...I have already spoken to the principal [in my school] whether I could get...so that I can actually use them” (interview with Student E, November 2010, Case 2).

The multiple sources of data revealed that the collaborations within the online discussion forums; ongoing documentation and sharing of artefacts; and opportunities for peer-peer feedback prompted students to compare their thinking or artefacts with that of peers. This in turn stimulated them to self-regulate and revise their learning strategies in order to achieve desired performances. Self-regulated learning was also manifested through students’ awareness of their own learning goals, the ability to reflectively articulate what and how they learned.

Both the analysis of the archived course discourse and interview transcripts revealed metacognitive processes as the students were also able to recount how their reflective processes (and sharing this with others) supported them to learn more meaningfully.

I think it [reflections on learning and assessment processes] allows one to formulate your ideas and show the journey of your ideas...So having some record to show the journey that I am taking was quite powerful because I could go back and have another look at it and I could say “I can’t believe I said this and now I think this”. I think it is also quite powerful having people seeing what I am thinking and coming back to give me feedback (interview with Student B, Case 1, November 2010)

Thus far, it is now evident that the ongoing and interweaved formative and summative assessment promoted meaningful learning experiences in both online courses. The next section looks at the core and emerging strategies for online formative assessment that supported the evident meaningful learning.

6.4.2 What are the strategies (core and emerging) for online formative assessment?

Self, peer, and teacher engagement with formative assessment were among the core strategies that are evident in both cases. The overlap and interweave between formative and summative assessment was also manifested as a core strategy for formative assessment in both cases. Analysis of data from the various sources in both cases showed that these strategies were facilitated through shared purpose and responsibilities among the key actors (the individual student, peers, and teacher) as they engaged with the various ongoing assessment activities and formative processes. Table 6.1 describes these four core strategies, and also shows the

development of an effective learning community as an emergent strategy in each of the courses. The Table is followed by illustrative evidence and related discussion.

Table 6.1: The strategies of online formative assessment as part of embedded assessment that facilitated meaningful learning

Strategy in both cases		Techniques (facilitating tools and opportunities) presented based on their first instance of occurrence includes overlap	Manifestation in the categories emerging from the gathered data (illustrative sample categories selected from key coded themes that are common across the cases)
1	Teacher engagement with formative assessment	<ul style="list-style-type: none"> • Offering to the students the formative assessment activities coupled with learner autonomy and explicit expected outcomes • Offering opportunities for collaboration and shared meanings through use of asynchronous topical discussion forums and open forums • Ongoing guidance and fostering the collaborative discourse and shared role with students in ongoing monitoring, assessing and providing formative feedback to students • Direct engagement in ongoing monitoring, assessing and provision of formative feedback • Enabling ongoing documentation and publicity of artefact enriched opportunities for ongoing monitoring of evidence of learning and formative feedback 	<ul style="list-style-type: none"> • Teacher formative feedback - responses to students question and/or teacher feedback prompted by her monitoring the student's progress and achievement • Teacher guidance, scaffolding, modelling and fostering shared purpose and role • Teacher as a co-participant in the discussion forums • Reference to previous contributions (by self or others) within the discussion forums • Teacher recognition of peer-peer feedback
2	The overlap and interweave between formative and summative assessment	<ul style="list-style-type: none"> • The formative and summative assessment activities were ongoing, that is, they were offered at the outset of the course, and were distributed throughout the course • They mapped onto each other (e.g. in Figure 5.2 for Case 1) such that they interweaved to inform the next. Case 2 had a similar form of overlap and interweave but slightly different form of build up (see Section 4. 5.1) • Opportunities for students to receive and use the formative feedback they received to revise their work, and improve their understanding of content and achievement over time for both formative and summative purposes • Ongoing documentation and publicity of artefacts by enhancing the opportunities for ongoing monitoring, assessment, and feedback 	<ul style="list-style-type: none"> • Students recognizing the building of a bigger picture from a variety of assessment activities- students able to connect how the assessment activities maps onto each other • Students' awareness and identifying connections across a variety of assessment activities, and applying ideas from one assessment to inform another assessment activity • Teacher fostering and supporting students to achieve meaningful artefact (products and processes) and helping them to see connection among assessment tasks - how one assessment can inform or build into another assessment task
3	Self formative assessment	<ul style="list-style-type: none"> • Topical online discussion forums as the individual students compared their thinking with that of others and reflected upon the responses (feedback) from others • Ongoing documentation and publicity of artefact – this provided the students an opportunity to review previous contribution (by self and/or others, rethink and reflect upon their contributions before posting online) • Analytical rubrics as applied by self to assess own work 	<ul style="list-style-type: none"> • Awareness and debriefing of individual's progress or current way of thinking in relation to understandings of content, accomplishment of expected outcomes • Self awareness of individual's perceptions and recognition of changing perceptions and developing abilities • Self awareness of individual's learning needs and style as an online learner • Debriefing or articulating of own learning experiences within the

Strategy in both cases		Techniques (facilitating tools and opportunities) presented based on their first instance of occurrence includes overlap	Manifestation in the categories emerging from the gathered data (illustrative sample categories selected from key coded themes that are common across the cases)
		<ul style="list-style-type: none"> • Open forums as the student reflected upon and sought to validate their own understanding of expected outcomes • Peer-peer review and formative feedback on completed artefacts as each student discerned what was meaningful in their own contexts from peers' work 	<ul style="list-style-type: none"> • course • Connecting ideas/experiences to own work (professional) contexts, experiences and practices • Connecting ideas to broader real-life contexts, issues and practices • Reference to previous contributions (by self or others) within the discussions
4	Peer formative assessment	<ul style="list-style-type: none"> • Topical online discussion forums as students interacted with peers' contributions and offered feedback on this • Ongoing documentation and publicity of artefact, which allowed self review and reflection upon peers' thinking and reflections before offering their feedback • Analytical rubrics as applied by individual to formatively assess (or review) peer's work • Open forums as students responded to peers' thoughts • Peer-peer review and feedback on completed artefacts as students interacted with peer's work, reviewed it against the rubrics and offered constructive feedback 	<ul style="list-style-type: none"> • Peer formative feedback - constructive responses from peers upon one's idea/work or question • Recognition of feedback or support from peers • Recognition of self as a source of learning support or feedback • Sharing individual views and understanding of content - initiating or extending a discussion thread within the class forum - learners as thread starters or extenders • Identifying and connecting with common ideas and interests among peers • Connecting ideas to own professional contexts, experiences and practices • Connecting ideas to broader real-life contexts, issues and practices • Reference to previous contributions (by self or others) within the discussions
5	Development of a robust and supportive learning community	<ul style="list-style-type: none"> • Dynamic interactions and collaboration within the topical and open online discussion forums • Learner autonomy through stimulating dynamic interactivity and meaningful dialogue • Shared professional identity (as teachers) which stimulated meaningful dialogue and sharing of lived experiences • Ongoing documentation and publicity of artefact which enhanced interactivity 	<ul style="list-style-type: none"> • Recognition of the class as a learning community (manifested in various ways, such as: use of collective terms, sense of reciprocity or mutuality, identifying and connecting with common ideas and interests among peers) • Directly asking peer a question or prompting for feedback from others (peers/teacher) • Teacher recognition and fostering the view of the class as a supportive learning community - seeing learners as a learning support for peers in their class • Connecting ideas to own professional contexts, experiences and practices • Connecting ideas to broader real-life contexts, issues and practices

As shown in Table 6.1, the first core strategy in both courses was ***teacher engagement with formative assessment*** which entailed the course designer (teacher) providing a structure for ongoing formative assessment by offering a variety of ongoing and authentic formative and summative assessment activities, learner autonomy, facilitating transparency of meaning of the expected outcomes (summative assessment guidelines and rubrics), allowing for openness of learning and assessment processes and products, provision of ongoing guidance and modelling, and facilitating and encouraging productive interactivity with content, with self (self-reflection), and with other course participants. In addition, both teachers explicitly encouraged shared understanding of expected outcomes amongst participants through use of open forums.

The findings from variety of sources show that both teachers monitored the students' progress and provided desirable feedback as they engaged with the learning and assessment activities. Teachers' feedback in both courses was commonly characterized by clues and probes as opposed to direct solutions, which prompted students to reflect on their learning processes and expected outcomes. This resulted in feedback that was iterative and dialogic in ways that promoted reflective thinking; which in turn stimulated peer-peer formative feedback. It was also evident that ongoing formative assessment processes sustained learners' engagement with valuable learning experiences particularly in the development of self-regulation dispositions which in turn supported deep and contextualized learning that enhanced learners' ability to integrate ICT in their own professional practice contexts.

Secondly, the **overlap and interweave between formative and summative assessment** was another core strategy that was evident in both courses. The ongoing variety of interweaved summative and formative assessment activities were embedded within the teaching and learning activities in each course. These activities mapped onto each other such that one assessment activity informed and/or built up onto another one. This structure offered the students many opportunities to receive and intentionally use the feedback that they received (from the teacher and peers) to revise their assessed work, and improve their understanding of content and expected outcomes for both formative and summative purposes. The overlap and interweave between formative and summative assessment supported the students to improve their overall achievement over time. In part, this also motivated students'

commitment to formative assessment processes in ways that promoted their learning experiences through opportunities to interact with others and receive formative feedback to support them to close their performance gaps. As earlier illustrated within individual case findings (Chapters 4 and 5), and further analyzed here, both teachers had purposefully designed this authentic assessment structure and the students recognized this as a valuable aspect. The teacher also motivated students' active engagement in order to promote opportunities for ongoing learning scaffold, especially by interacting with peers and the teacher. For instance, this excerpt reveals one teacher's ongoing encouragement to the students. This excerpt was part of teacher A's reply post to students' contributions as her reflective summary in wrapping that particular discussion forum.

Yes, I have deliberately included participation in the assessment activities to provide some motivation and incentive - because I believe that learning can be fostered through social interaction - a pedagogy of participation (Teacher A, 'Chapter 2 Discussion Forum (Facilitator: Student B): So to conclude' in online discussion forum, Case1, 31 March 2010)

Thirdly, *self formative assessment* was evident in both courses and was manifested through the aspects of self monitoring, reflection, regulation, and metacognition. The evidence relating to these aspects is illustrated in the preceding section with respect to processes of meaningful reflectivity and self regulation. As shown in Table 6.1, these aspects emerged through varying themes within the data gathered from various sources. Through these processes students were able to self-assess their progress and achievement in relation to the learning goals and expected outcomes, which in turn triggered them to intentionally seek feedback from others and devise desirable learning strategies in order to close their performance gaps. At the end of the course, students were also in a position to articulate their competencies and ability to transfer their learning to their own practices and contexts.

The reason why I took this course is that I wanted to build my knowledge about what ICT... So I feel like I have ability to decrease the digital divide because I have some knowledge in ICT and its relevance in learning, in education...so I want to go back to work and make some kind difference with ICT (interview with Student A, Case 1, November 2010)

I feel I have learnt, and what I did can actually influence my school in future...So I feel you have something to share in regard to making things improve (interview with Student L, Case 2, November 2010)

The analysis of the archived course discourse showed that self-assessment in both courses was facilitated through use of various techniques and opportunities including analytical rubrics, collaboration within online discussion forums, course participants' engagement within the open forum for sharing meaning of rubrics and other assessment

related issues, ongoing documentation and publicity of artefacts, and peer-peer review of completed artefacts. This sample excerpt from the interview responses also illustrates how the analytical rubrics supported self-assessment.

I followed the rubrics quite clearly. I could use them to assess my progress...guiding me in things like what is required, where am I? It could guide me in the things I needed to cover in terms of setting up the project or designing the activities so that I could do things as required. So in that way they helped me know am here and where am required to be... (interview with Student G, Case 2, November 2010)

Additionally, self-assessment in Case 1 was also facilitated through individual reflective journals which were public to other course participants with an aim to stimulate external feedback from both the teachers and peers. These online reflective journals were designed as an open reflective journaling forums. This openness allowed the course participants to interact with and provide external feedback on individual self-reflections (internal feedback) in way that created a constructive interlink between internal and external formative feedback, hence a synergy between self and peer formative assessment. As illustrated in Figure 4.8, the opportunities to receive external feedback within own reflective journal resulted to a constructive synergy between internal and external feedback in ways that stimulated meaningful reflectivity and interactivity among the course participants in Case 1.

Fourthly, *peer formative assessment* was another core strategy evident in both courses. As detailed in Table 6.1, the techniques for self-assessment also facilitated peer formative assessment in varying ways. Through these techniques, students had adequate opportunities to share their own ideas and artefact, monitor, interact with peers' ideas and review their artefacts, which prompted them to provide constructive feedback to their peers, hence peer formative assessment. For instance, the students' participation and interactions with peers within the asynchronous online discussion forums facilitated peer-peer feedback as the students negotiated shared understandings within a social context which elicited constructive responses from/to peers (peer-peer formative feedback). It was evident in both cases that peer-peer formative feedback processes within the threaded asynchronous discussions forums were characterized by looped interactivity. Following analysis of the course discourse, the emerging feedback loops were explicitly illustrated within individual case chapters using network diagrams as presented earlier in Case 1 and 2 (see Figures 4.6 and 5.4 respectively).

Evidence obtained from multiple sources further showed that the students also benefited in giving and receiving feedback to/from peers on their completed artefacts. The analytical rubrics and enabled openness supported students in both courses to formatively assess peers' work and provide critical formative feedback.

It [peer-peer feedback] helps to bring multiple points of view. The others can bring their ideas that allow you to think things you had not thought of. In this way it helped me to enhance my understanding of content... For me, the biggest thing was other people identifying how they could use what I had done... I have given them something new to think about and they have also given me... (interview with Student B, Case 1, November 2010)

I gave action research project feedback to three people or may be more on what they did and I hoped my feedback would be received not just as compliment but they could also see it as a means of something else that they might look at. So in giving feedback I felt also I was learning because when I was looking at their presentation, I thought, ooh, that is another way that I could probably have used that tool in my own classroom, so it does have that effect, it has ripple effects (interview with Student A, Case 2, November 2010)

Evidence obtained through multiple sources of data showed that the overlap and synergy among these core strategies facilitated and sustained adequate opportunities for dynamic and ongoing interactions amongst the students and teacher. These multifaceted interactions supported development of a robust and interactive learning community in each course as an emergent strategy. ***The development of a supportive and interactive learning community*** is therefore an additional strategy that emerged out of the synergy among the identified core strategies of online formative assessment.

The online observations and analysis of the archived course discourse revealed that the emergence of an effective learning community in each of the two online courses reciprocally nurtured the formative assessment processes. The sense of learning within a strong community bound by shared goals and recognition of common practice (as professional teachers) fostered reflective interactivity within the online discourse in both cases. Moreover, it greatly enhanced opportunity for interactive formative feedback processes through eliciting meaningful dialogue as students inherently connected to and shared their existing knowledge, and lived experiences as professionals. This was clearly manifested through the emerging diverse perspectives, which were constantly framed within real-life professional practices, issues and contexts. The diverse and contextualized perspectives immensely enriched and expanded opportunities for critical formative feedback that supported students to enrich their understanding of content and expected outcomes. The exchange below (which is an initial

post by Student Q and response from Student G in Case 2) illustrates such contextualized aspects within formative feedback processes:

I have found the first reading...to be very thought provoking. I found myself cringing at times as I realized that a great deal of my teaching and assessment is based around the students being able to regurgitate what I have told them. For a while now I have realized this is pointless and that I am rewarding those students who can put my speech and words on their test papers...Also I am often concerned when my students want to learn about things that are not related to the assessment - sometimes I don't have a single period to spare in order to 'prepare' students for their exams. Also for the first year teacher in a new school - can they teach in this manner without any real structure?... (Student Q, online discussion forum, Case 2, 15 July 2010)

My experience of teaching science in a secondary school in the UK is that in order to cover the curriculum within the given time frame (especially for exam classes) there was not a spare moment and we taught topics on rotation... I agree that any departure from the 'timetable' to investigate other topics of interest or as they were raised was limited and felt almost naughty...I am also with you on cringing about my teaching but as many people have indicated here they have a desire to teach with technology and so perhaps this can be the start of learning how to do this effectively. The skills and knowledge can then be passed to others - the start of the bottom up pressure for change (Student G, online discussion forum, Case 2, 16 July 2010)

Through the analysis of the archived course discourse, it became evident that the interactivity within feedback processes expanded opportunities for learning scaffold and increased the quality of formative feedback that was manifested by a dynamic dialogic process in ways that promoted reflective thinking and deep inquiry. In these ways, the synergy between the core formative assessment strategies and development of an effective learning community in each course became a valuable strategy in offering the students a variety of opportunities for meaningful interactivity and critical formative feedback that fostered meaningful learning in both cases.

Notably, the sense of a learning community with shared purpose and identity emerged strongly in both courses because the students were knowledgeable professionals who already had previous academic qualifications and professional experiences. It is also important to note that both teachers in these courses recognized and valued that their students were coming to their online classrooms with previous knowledge and professional experiences. The analysis of the online discourse and interview transcripts showed that both teachers' pedagogical philosophies (beliefs and dispositions) influenced the way they designed their respective course to support their students to actively participate and engage with others (particularly the teacher and peers) in developing learning resources and opportunities for both individual and group learning. Both teachers' beliefs and dispositions revealed a sense of constructivism,

collaborative knowledge building and connectedness with others as a learning community. In expressing what influenced them to incorporate formative assessment in their respective course design, both teachers separately noted that:

I don't have set content, but I know what the learning outcomes are for the students but the content is really being generated depending on what students' needs and interests are (initial interview with Teacher A, Case 1, March 2010)

I am a strong believer about creating our own content, talking about what we have created, deconstructing it by peer reviewing. So it is a sort of constructivist and connectivist approach that I truly believe in (initial interview with Teacher B, Case 2, July 2010)

Underpinned on such beliefs, it became evident that both teachers had intentionally designed for learner and assessment centred strategies particularly through integrating formative assessment that encouraged interactive collaboration, and stimulated their students to apply their existing knowledge and share experiences as knowledgeable professionals in ways that enriched their learning experiences and fostered development of effective learning community with shared purpose, responsibilities, and ownership.

Despite the shared responsibilities and ownership which was nurtured by development of effective community within each of the two online courses, it is important to note that this did not reduce the role of the teacher as an expert in the course content and a lead facilitator with more authority. The teachers' involvement in ensuring efficacy within the collaborative formative processes, encouraging active participation, direct contributions through offering reflective summaries and weaving the asynchronous discussions was evident within their contributions that enriched the discourse with expansive ideas and probes. The teachers commonly wove the discussions in a way to expand the dialogue and/or picking up on uncovered aspects in relation to the relevant topical content. Both teachers demonstrated expert facilitation by regularly pulling together the participants' contributions in expansive ways that stimulate new thoughts, and extended collaborative online discourse with new themes, thus scaffolding learning. Figure 5.1 illustrates such instances. The Figure provides a summary of the core themes of the course content developed collaboratively by the course participants within Course 2 which emerged from students' participation within the topical online discussions. As described earlier, student participation in these topical forums was both a learning activity and part of assessment in both courses. As earlier illustrated in Figure 5.1, Teacher B collated the themes at the middle of the Course 2 using 'Wordle' as an innovative way of using ICT tools to pull together and summarize the key concepts emerging from

shared discourse. Teacher B posted these weaved themes on the home webpage of the course as a way of fostering reflectivity and shared ownership. This manifests how the involvement of both teachers in this study sustained an authentic online discourse in ways that allowed participants' ideas to flourish, increasingly developing into in meaningful dialogue that resulted to more interactive and reflective collaborations within the emergent learning community in each course. This in turn fostered learning processes in ways that enriched shared meanings and ownership, and interactivity within formative feedback processes.

It is notable that the technique for ongoing documentation and sharing (publicity) of learning and assessment (summative and formative) processes and products enhanced all the five strategies. This evidently reveals one of the key benefits of applying formative assessment within online contexts. In both courses, this technique provided unique and enriched opportunities (as compared to face-to-face settings) for ongoing monitoring, assessment and formative feedback in various ways. Firstly, a key aspect is how ongoing documentation and sharing enabled the course participants to refer back to previous contributions by themselves or others within the online discourse. This aspect increasingly enhanced formative feedback processes as the students had adequate opportunities to engage with themselves as they reviewed and internalized the feedback from others. Secondly, it gave students adequate time to review and reflect upon others' thinking, compose their ideas and in turn offer deeply thought peer feedback. Thirdly, such opportunities also served an important purpose particularly in informing formative feedback processes and enabling students' ongoing work to serve as exemplars to peers. Fourthly, the ongoing sharing including publicity of learning needs and received feedback enhanced effectiveness and efficiency of feedback as the students benefited both cognitively and affectively from their peers' feedback. Fifth, ongoing documentation of evidence of learning offered the teacher enriched opportunities to engage with and reflect upon students' progress and evidence of learning and in turn provide adequate formative feedback.

Through the evident five strategies and related techniques, the validity and reliability of online formative assessment as described in Section 2.5 was essentially addressed in both cases. Validity was achieved through the following aspects which are manifested within the individual case findings and the cross-case analysis thus far: (a) provision of variety of ongoing and authentic assessment activities that fostered contextual, inquiry-based learning and multidimensional perspectives, (b) adequacy, immediacy and interactivity of formative

feedback, and (c) shared responsibility in ongoing monitoring, assessment and formative feedback processes. The reliability of online formative assessment was achieved through adequate opportunities for: (a) ongoing documentation and monitoring of learning, (b) multiple sources of evidence of learning, (c) provision of analytical rubrics and exemplars, and opportunities for negotiating their meanings, (d) dynamic ongoing interactions that fostered shared meaning of learning goals and expected outcomes, and (e) ongoing documentation and publicity of learning and assessment processes and products. Similarly, the findings further showed that the authenticity and autonomy within the assessment activities was useful in addressing the threats of surface learning and dishonesty. This is because, the students were stimulated to deeply focus on their learning goals and interests resulting to diverse approaches and outcomes evident within students' artefacts. As illustrated within the individual case findings, it became evident that learner autonomy and associated multidimensional perspectives greatly contribute in minimizing dishonesty even when students made their artefacts public as a means to encourage interactive collaborations and formative feedback. The inherent multidimensionality resulted to diverse approaches and outcomes thus allowing students to share their assessment work without encouraging rote learning and dishonesty.

Based on the findings of both cases, it is also important to note that these aspects of validity, reliability and dishonesty were intertwined. For instance, students explicitly recognized how the aspect of interacting with others' ongoing work by being public to all participants served as exemplars and facilitated peer-peer formative feedback. One student went further to recognize how authenticity inherent within assessment activities discouraged surface learning or dishonesty issues among the students such as rote engagement or lifting from each other despite this visibility aspect. She stated:

Seeing other peoples' work served as examples developing with time because it helps one to know whether is on the right track. Also, it is quite useful because there were obviously huge overlaps between what people were doing and it was nice to be able to read something and think that this fits what my colleague is doing and I could just send and say, I have read this,...this might be also useful to you. Initially for me, the whole assessment thing has been very individual to me but in this class everything was so open, and clearly there wasn't anything like a person is going to copy from you because although the assignments are related and we could learn from each other, they were still very different (interview with Student G, Case 1, November 2010).

Despite the benefits discussed thus far, it is also important to note that some issues of concern were also identified in this study, which if not properly addressed can hinder the

identified benefits in relation to achieving meaningful learning through integration of formative assessment in online courses. The identified issues of concern and how they were addressed in both cases in order to realize the evident benefits are presented in the following section.

6.4.3 What are the related issues of concern for online formative assessment?

Informed by data obtained from the various sources, this study identified a number of issues of concern that need to be addressed and/or managed appropriately in order to achieve effective formative assessment. The identification of these issues and how each was managed within both courses contributes to the lessons learned from the findings of this research. Table 6.2 offers a summary of three key issues identified in both cases, which are further described in the following discussion.

Table 6.2: Some of the key issues of concern emerging as learned lessons

Issue of concern	Lessons learned	How this emerged in Case 1	How this emerged in Case 2
Managing learner autonomy	The teacher is required to be vigilant and open-minded, any concerns that emerge require to be managed tactically	Some concerns emerged from learner autonomy within the collaborative online discourse as the nature of some student's participation appeared to threaten others' participation within the online discussions	Varying opinions among students in relation to when and where to initiate new threads within online discussion forums
Diversity of existing knowledge and experiences	Recognize the diversity among learners in ways that support learners' diverse needs, while also exploiting this as a potential learning resource	Emerged as a positive learning experience and to some extent it was also challenging but later in the course it became a valuable experience to most students as they struggled to connect with the emerging diverse perspectives which were a great shift to some	Emerged as a positive learning experience – for instance, the student explicitly appreciated how the great shift from their previous experiences enhanced their learning experiences
Adapting to learning online and asynchronous interaction	Failure for learners to take responsibility to adapt their learning style to fit online settings can negatively affect active participation and productive interactions with others in online learning and hinder learners from benefiting from online formative assessment processes, for instance, feedback as dialogue, shared role	To some extent, this emerged as a challenge initially for two students but increasingly these students became flexibly adaptable to learning online	An outlier case emerged which was part of the challenge for Student K who was unable to adapt to learning online leading to eventual withdrawal from the course. The learning style was only part of the challenges because this student had other unique problems such as lack of adequate commitment and personal issues

It became evident that for effective online formative assessment to be achieved, explicit clarification of assessment requirements at the outset is critical. This entails the teacher fostering shared understanding of the purpose of the assessment activities in relation to explicitly defining the learning goals and expected outcomes, and the expected students' involvement in the assessment processes. In this study, both teachers were keen to facilitate shared understanding of purpose and meaning of rubrics. This prompted the students as key actors in ways that fostered shared responsibility within the formative processes.

Moreover, in order to achieve effectiveness in online formative assessment, it is necessary for the teacher to provide ongoing guidance and modelling in order to support the students to engage productively with the authentic assessment activities that were inherently autonomous. The findings in both cases reveal that, besides the clear guidelines and analytical rubrics, the students also required and valued ongoing teacher's guidance and modelling. Such guidance supported them to identify and structure their focus of interest as they engage with the authentic activities characterized by learner autonomy. This implies that failure to offer appropriate guidance can lead to loss of focus and frustrations that can hinder students from engaging productively.

As part of effective online facilitation, it is vital for the teacher to manage the learner autonomy appropriately. This includes ensuring effective collaboration within the online discourse in ways that cater for diverse participants' experiences, needs and expectations, as well as foster shared meaning of purpose and learning goals. As it emerged from the findings in both case studies (see Table 6.2), within the permitted autonomy, the course participants had varying expectations/preferences that required the teacher to be tactical in managing the issues that emerged. For instance, Teacher A in Case 1 had a challenging experience in ensuring that the nature of participation by a few students did not negatively affect their other students' participation. Notably, both teachers did not manage such issues in isolation; instead, they also involved students (where necessary) to express their views, feelings and preferences, and seek consensus within the course community.

Failure to recognize diversity among learners in relation to their previous experiences, learning capabilities and needs, as well as providing learning support that recognizes and responds to the diverse needs can hinder or reduce the effectiveness of formative assessment in online courses. As it emerged in this study, students had varying background, capabilities and needs that necessitated both teachers to offer some individualized support. Moreover, it is

necessary for the online teacher to ensure an optimal blend between private interactions (through emails) and public interactions (within open online discourse) between the teacher and the students in order to provide adequate opportunities for students to voice their needs and elicit desirable formative feedback. In this study students appreciated and benefited from opportunities to seek support both privately and publicly.

In both cases, the teachers also exploited the aspect of diversity as an opportunity for contextualized learning through providing the student with an opportunity to share with others their existing knowledge and experiences in ways that enriched the collaborative online discourse as they shared their lived experiences as professionals within a supportive learning community. This in turn became a great source of valuable learning experiences for these students as they were exposed to new, and to some, very different possibilities and contexts. On the other hand, it also required these students to flexibly shift their thinking and perceptions in order to productively connect with the new contextual perspectives that were emerging within their online learning communities.

It also became evident that failure by individual learners to adapt their learning styles to fit asynchronous interactions in online settings can hamper active participation and productive interactions in online learning. This may also reduce effectiveness of formative assessment in online courses such as hindering dialogic feedback and shared role in formative processes. Some students may require support from others (both the teacher and peers) to overcome this challenge. This issue was encountered in both courses where some students had difficulties adapting to learning online initially. The affected students were however able to overcome the challenge through support of others and their willingness to devise new learning strategies that fitted their learning in these online settings. As illustrated in both cases, although support from others (both teacher and peers) can help students to adapt to learning online, it also requires individual learner's commitments to adapt own learning styles to fit asynchronous settings. For instance, there was an outlier case for the Student K in Case 2 who was not flexible enough to adapt own learning style to online settings. The learning style for this student; compounded by lack of confidence and commitment to learn in asynchronous settings became a major source of his/her challenge, and eventual frustrations to the extent of not completing the course successfully.

Overall, the issues discussed here reveal the importance for the teacher to be attentive and open-minded in order to respond appropriately in ways that promote productivity of

online formative assessment. This implies that, while it is impossible to anticipate the possible issues of concern within formative processes, it is necessary for teachers to be well prepared that critical issues are likely to emerge.

The key findings examined this far exemplify how formative assessment was integrated in both courses and how it promoted meaningful online learning. The following section offers the key characteristics for effective online formative assessment identified in this study through critical re-examination of the findings of both cases.

6.4.4 Summary of key characteristics

This section presents the key characteristics underlying effectiveness of online formative assessment that were evident in both case studies. These key characteristics were identified with an aim to provide insights that may guide practice in design and implementation of online formative assessment. Figure 6.1 provides an overview of these nine characteristics as summarized in this section. The circular shape of the figure indicates that these characteristics were iterative and interrelated. The emerging key characteristics are highlighted in **bolded italics**.

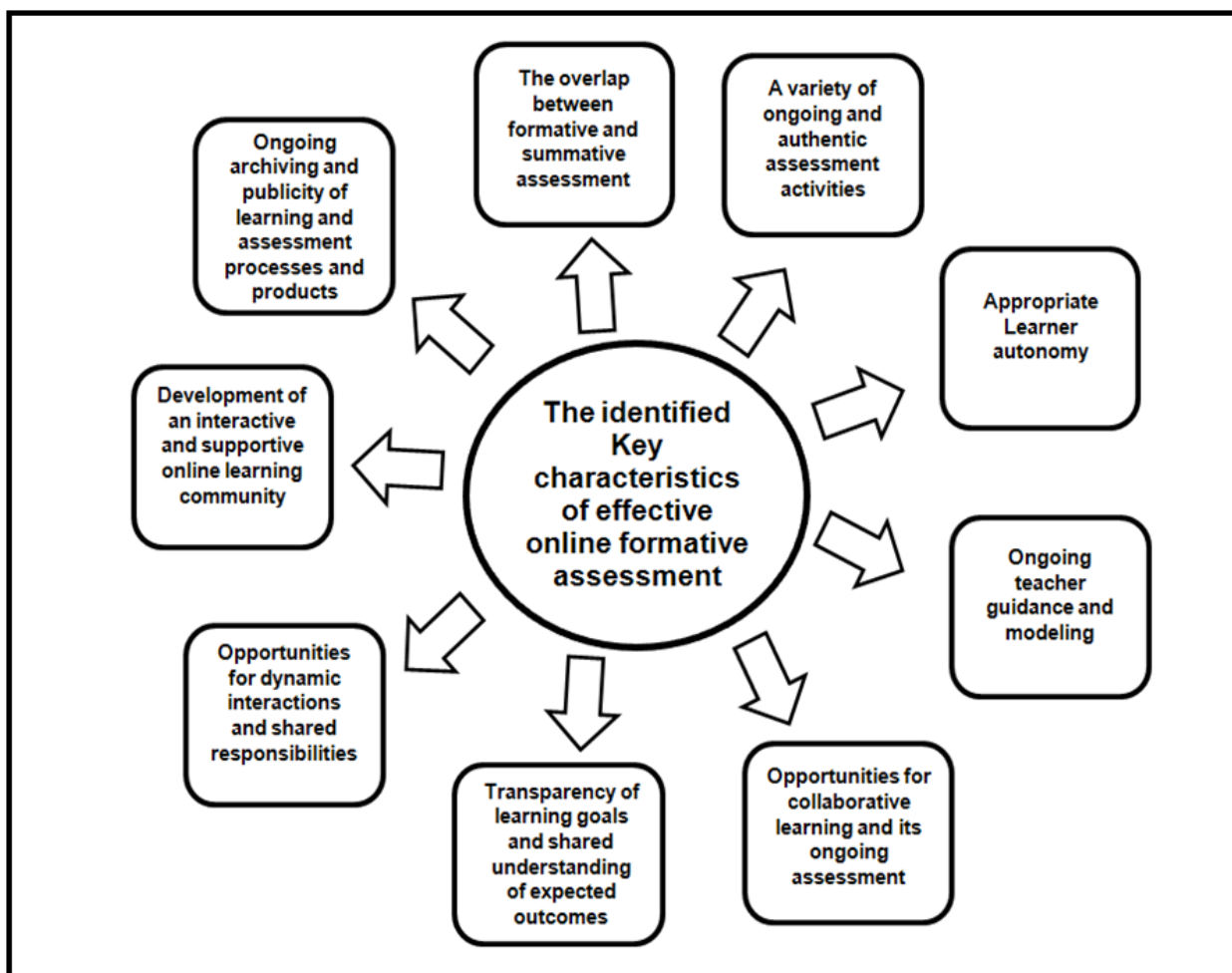


Figure 6.1: Overview of the nine key characteristics of effective online formative assessment as identified in this research, which were iterative and interrelated as the circular shape depicts

At the outset of each of the courses, the teacher had offered a variety of ongoing summative assessment activities, and clear guidelines and analytical rubrics in which the expected outcomes were defined. As it has emerged thus far, these summative assessment activities, plus other formative assessment activities and processes were embedded within teaching and learning processes to serve both formative and summative assessment purposes. The ongoing assessment activities and related processes supported the students to enhance their understanding of the course content and expected outcomes over time through opportunities for ongoing formative feedback and revision. This in turn facilitated productive engagement and supported the students to close their performance gaps, and enhance their overall achievement in order to meet the programme (institutional) summative assessment requirements. Moreover, this supported students to achieve their learning goals and develop competencies that were transferable in their own professional contexts. The individual student's performance in various ongoing assessment activities was also aggregated at the end of the course to obtain an overall grade for summative purposes. Therefore, *the overlap and*

interweave between formative and summative assessment supported meaningful learning and its assessment.

Students' engagement with **a variety of ongoing and authentic formative and summative assessment activities** facilitated and sustained meaningful learning experiences. These authentic activities were relevant to real-world applications, complex, open-ended, and required and/or stimulated the students to connect and/or interact with real-life situations. The authentic assessment activities were also characterized by **learner autonomy**. The teacher provided the learners with opportunities for choice and flexibility. Students had opportunities to choose from a variety of relevant assessment tasks which stimulated them to engage in relevant tasks that also fitted their own learning goals, interests and contextual needs leading to varying approaches and diverse outcomes. This in turn supported students to learn from multidimensional perspectives while providing them with diverse opportunities to demonstrate their capabilities individually through development of expected artefacts. In these ways, the ongoing authentic assessment activities coupled with learner autonomy and formative processes created an authentic learning environment. In engaging with these authentic assessment activities **ongoing teacher guidance and modelling** was important in supporting students to engage productively and enable them to appropriately benefit more from the permitted autonomy. The teachers constantly monitored the formative processes and provided desirable guidance and formative feedback without necessarily providing direct solutions. This form of ongoing learning support and scaffold enabled the students to engage meaningfully in problem solving and decision-making which sustained appropriate complexity and cognitive engagement, while also ensuring that the potential challenging experiences associated with authentic learning context did not degenerate to become learning barriers.

The ongoing formative and summative assessment activities and related processes in both courses provided a structure for learning in ways that facilitated a learner and assessment centred focus which stimulated students to actively engage in learning and assessment processes. The students were involved in generation and negotiation of meaning of the course content through participation and collaboration within the topical asynchronous discussion forums. This fostered dynamic interactivity, co-construction of knowledge through multiple and divergent viewpoints, and peer-peer formative feedback. Students' participation within these asynchronous discussions was assessed which, in part, stimulated their active involvement. Interactive collaborations within the discussion forums also provided the students with opportunities for shared understanding of expected outcomes as well as sharing

their developing thinking and/or artefacts in progress with peers while receiving formative feedback that supported them to improve their work and close their performance gaps. These ***collaborative learning opportunities facilitated collaborative knowledge building and its ongoing assessment***. To facilitate collaboration in the learning and assessment processes, both teachers provided opportunities and fostered sharing of meaning of assessment guidelines and rubrics through open discussion forums which enhanced ***transparency of learning goals and shared understanding of expected outcomes***. This supported students to monitor and assess their own learning as well as that of their peers which in turn supported them to deeply reflect upon their progress and achievements. Additionally, students were motivated to devise appropriate learning strategies and enhance their achievements over time.

Moreover, shared understanding of learning goals and expected outcomes ensured efficacy within the collaborative formative processes in way that fostered ***dynamic interactions and shared responsibilities among the individual student, peers and the teacher as key actors***. Sustained interactivity and the sense of shared responsibility fostered the ***development of an interactive and supportive online learning community*** in each course. Purposeful interactions within the emergent community facilitated meaningful learning processes and ensured adequate learner support. Both teachers within their respective course community interacted with students while continually monitoring and assessing students' expected learning and achievements. Additionally, both teachers explicitly fostered shared purpose of the assessment activities and inherent processes in stimulating students' active engagement in application of the rubrics to assess self as well as peers. Within the shared responsibilities, the teacher and students roles were reconstructed to assume new roles as facilitators and co-participants. Evidently, the students increasingly developed mutual responsibility and recognized themselves as source of learning support for their peers, which in turn enhanced the formative processes particularly in relation to increasing the immediacy and interactivity of formative feedback. Both teachers also played a critical role of effective facilitation especially in ensuring efficacy within shared responsibility. In effect, this required the teachers to be vigilant and open-minded in order to effectively facilitate the online discourse and ensure the efficacy of the shared responsibilities within formative processes while responsively managing any emerging issues.

The ***ongoing archiving and publicity of student-created artefacts that was sustained within the online courses provided enriched opportunities for ongoing monitoring, assessment and formative feedback processes***. This was another identified key characteristic that supported effective online formative assessment in both cases. The opportunities for

ongoing documentation and publicity of artefacts fostered shared role in ongoing monitoring and assessment which in turn enhanced the formative feedback processes particularly in increasing the quality of formative feedback in regard to immediacy, adequacy and interactivity. The feedback was timely as it was provided close to the time the learning occurred, as well as being ongoing as it was offered promptly and specifically in response to the learner's identified needs or request for support on a particular task and/or process. This in turn gave the students sufficient time and opportunities to revise their work and close their performance gaps in relation to the expected outcomes. This ongoing sharing of artefacts including publicity of learning needs and received feedback enhanced effectiveness and efficiency of feedback because the students benefited both cognitively and affectively from peers' feedback. The sharing also enabled the students' ongoing work to serve as exemplars.

Of particular importance is how the ongoing documentation and publicity of learning and assessment processes within these online classrooms offered students with opportunities to revisit previous postings (contributions by self and/or others). This in turn enhanced formative feedback processes through stimulating internal feedback (self-reflection) as students had adequate opportunities to review the feedback that they received. Furthermore, it provided students with sufficient time to review and rethink upon previous contributions before providing responses to their peers and this resulted to more constructive peer-peer formative feedback. The asynchronous nature of online environment also provided the students with opportunities to contribute well-thought initial posts and responses as they had enough time to review the discussion content or participants' exchanges, reflect, and then construct and assess their own contributions before posting online. The opportunities for ongoing documentation and publicity of artefacts also enhanced teachers' engagement with formative processes by providing them opportunities to engage with and/or reflect upon students' learning. This assisted the teacher in provision of adequate guidance, formative feedback and reflective summaries within the asynchronous discussions that were aimed at deepening collaborative learning. In these ways, the application of formative assessment in online settings (as compared to face-to-face settings) enhanced opportunities for ongoing monitoring and high quality formative feedback by self and others (teacher and peers).

To achieve broader and deeper conceptual meanings of the current research findings, the key findings from this collective case study are further interpreted and synthesized through generalizations to congruent theories as presented in the following chapter.

Chapter 7

7.0 Theoretical generalization of the study findings

7.1 Introduction

In an attempt to conceptually generalize the key findings of this study to broader theory (as a collective case study of two online courses), two congruent theories were identified to advance a relevant theoretical framework. The theoretical framework developed in this chapter therefore aims to uncover the broader and deeper conceptual meanings of the findings, and link the key outcomes of this study to the existing knowledge. Starting with a review of the identified theories, the discussion that follows seeks to elucidate a theoretical framework that can guide assessment of situated and authentic learning with a particular focus on online formative assessment. Lastly, the key contributions of this study are explicated relative to the existing research.

7.2.1 Assessment of situated and authentic learning

Extending the theoretical underpinnings presented in Section 2.9, situated and authentic learning have been recognized as suitable perspectives in promoting meaningful learning in (online) higher education through fostering higher-order learning and the development of metacognitive skills. Therefore, the understandings being advanced here are based on the theory of situated cognition (Brown et al., 1989) which suggests that meaningful and transferable learning occurs when learning and knowledge is situated within social and realistic contexts within which meanings are negotiated and validated. Brown et al. (1989), among others situativists (e.g. Barab et al., 2000; Lave & Wenger, 1991) have argued that perceiving and acting (perception-action process) are fundamental components of meaningful and transferable learning, and knowledge is embedded in the authentic activity, context and culture in which it is constructed and used. The situated cognition theorists (Brown et al., 1989; Collins, Brown, & Holum, 1991; Collins, Brown, & Newman, 1989) also emphasize that in formal learning it is necessary to go beyond the physical skills (craft or standard apprenticeship) to focus on the development of metacognitive skills (or cognitive apprenticeship) in order to promote construction of robust knowledge and transferability to new situations. Drawing from these theorists, Young (1993) suggests that learning is situated and an ongoing perceptual change as learners increase their ability to detect information and navigate through a problem solving situation, and figure out appropriate strategies that can enable them to solve a complex and realistic problem situation that constitute an authentic

activity. Problem solving in this context refers to “an interaction between the problem solving skills of the learner and the activities and manipulations that a particular problem affords” (Young, 1995, p. 90). As Young (1995) noted, problem solving is not linear in nature, but a complex and dynamic evolving process within which sub-dilemmas are discovered with the initial strategies for achieving solutions being revised, which may also lead to reconstruction of the initial goals. Accordingly, previous research indicates that situated learning necessitates congruent assessment approaches (Herrington & Oliver, 2000; McLellan, 1993; The Cognition and Technology Group at Vanderbilt (CTGV), 1996; Young, 1995). Assessment of situated and authentic learning can be enhanced through embedding of ongoing authentic assessment activities to enable measurement of complex and non-linear processes and products that characterize authentic learning activities and contexts (Young, 1995). In explaining the basis for embedded authentic assessment activities, Young (1995) asserted that:

Accepting situated learning means accepting that assessment must be validated by its real-world usefulness...instruction and measurement must be constructed and implemented as one. Assessment must not only be integrated with instruction, but also focus on problem-solving process along with problem solutions... [there is] need for assessments that externalize the perceptions of each problem solver that are only implicitly available from verbal protocols... [a viable] approach is to acquire as much information about the context and actions of the problem solver while engaging in the problem solving process. (Young, 1995b, p. 91)

As Young (1995) noted, embedded assessment (which is situated within the same context and based on the same authentic learning activities) is also valuable in recognition of the cumulative and interrelated nature of learning. Moreover, in order to adequately account for situated learning, it is essential to assess the dynamics of context in which the goals and strategies are constantly reconstructed throughout the process of accomplishing an authentic activity (Young, Kulikowich, & Barab, 1997). This provides a means for ongoing gathering of information about students’ understandings of learning goals and expected outcomes, and monitoring their progress with the aim to offer desirable formative feedback, which supports them to revise their learning strategies for improved outcomes (Young, 1995; Young et al., 1997).

Various benefits may emerge from such process-oriented assessment approach such as offering individual learners opportunities for adequate interactions with the problem space (the realistic activity at hand and its constituent constraints), which allow the productive process of discovering relevant information (resources) and the activity sub-components. It is within these processes that the learner is stimulated to interactively collaborate with peers and the teacher (and sometimes with others beyond their online classroom); and engage in

meaningful reflections about the use value of the learning activities. Similarly, the complexity that characterizes authentic activities necessitate prolonged period of engagement which provide opportunities to collect adequate information about the evolving goals and perceptions as students identify and actualize the best strategies in accomplishing the tasks at hand. Such assessment information is valuable for the teacher and the students alike in informing (both external and internal) feedback processes, and self-regulation in the light of that feedback. Moreover, as Young (1995), and Young et al. (1997) noted, effective assessment of situated and authentic learning is not obvious but potentially challenging due to its complex and non-linear nature, and it is therefore important for educators to apply innovative strategies that will enable assessment of both processes and products.

The levels of capabilities being developed have implications for assessment strategies whether in online or face-to-face settings (Oosterhof et al., 2008). In articulating how to assess the three core types of desirable capabilities (declarative, procedural, and problem solving) in formal learning settings, Oosterhof et al. (2008) noted that problem-solving capabilities (higher-order and metacognitive skills) may be assessed adequately using authentic assessment activities, which Oosterhof et al. defined as activities that: focus on both processes and products, are relevant to the domain being studied, involve relevant real-life applications, and require the learner to draw on their existing knowledge.

Formative assessment can be conceptualized from the perspective of embedded assessment of situated and authentic learning to enable process-oriented interactions among the learner, authentic assessment activity and the members of the learning community (particularly the teacher and peers) (Young et al., 1997). Drawing upon Young et al. (1997), these interactive processes are aimed at obtaining information regarding the evidence of learning and inform desirable formative feedback in order to support the learner move to higher levels of competence manifested by their ability to accomplish more complex tasks and development of self-regulation dispositions. Therefore, the assessment of situated and authentic learning is dynamic with the intention of achieving expected performances and having the information focused on interactions that provide opportunities for ongoing formative feedback. It also implies that, assessment within situativity perspectives necessitates going beyond assessment of current ability (the already learned content) to assessing the learning potential with an aim to support the learners to become self-regulated and independent users of the knowledge they develop, thus promoting a developmental perception-action process that stimulate perpetual self-improvement (life-long learning).

It is also apparent that assessment of situated and authentic learning is interrelated and overlaps with the Vygotsky's (1978) developmental theory of the ZPD and its integral notion of scaffolding. As Brown et al. (1989) acknowledge, the theory of situated cognition draws on Vygotsky's (1978) view of learning as a perception-action process within a social context. Engagement in complex problem solving (authentic activity) is a key feature in both situated cognition and ZPD theories. Other overlaps relate to embedded authentic assessment activities, emphasis on assessment of both the processes and products, focus on both the current and potential capabilities, and the collaboration between the teacher and learners as well as among the learners to allow for shared meanings and dialogic feedback as a means of scaffolding to support individual learners to exploit their cognitive development potential.

7.2.2 The ZPD and formative assessment

Vygotsky's (1978) focus on learning and development draws attention to ongoing assessment of both the competencies that have already been developed and those that are in the process of formation or development in order to inform the desirable formative feedback. In emphasizing the role of interactions with knowledgeable others (including peers) as a means of scaffolding learning and supporting cognitive development, Vygotsky defined the ZPD as 'the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined under adult guidance or in collaboration with more capable peers' (1978, p. 86). Although the Vygotsky's ZPD was initially applied in the context of a knowledgeable adult working with a child, this notion of socially mediated learning has been extended to formal higher education contexts (Yorke, 2003), and is conceivably a fundamental concept that underpins formative assessment (Allal, 2000; Ash & Levitt, 2003; Clark, 2010; Yorke, 2003).

Scaffolding is an integral concept within the ZPD that emphasizes social interactions and collaborations at the centre of learning and assessment processes. Purposeful interactions with knowledgeable others is integral to the concept of formative assessment in order to provide opportunities for scaffolding, a process which support the learner to accomplish a complex activity or achieve a goal which would otherwise be beyond his or her initial capability without support of others. The concept of scaffolding in this context therefore implies an interactive and developmental process that allows the learners to exploit their current capabilities in accomplishing an appropriately complex task within a supportive social context, which assist them (individually and/or collectively) to go beyond their initial capabilities and accomplish more complex levels of the task (Wood, Bruner, & Ross, 1976).

The processes underlying Vygotsky's ZPD closely align with formative assessment as it emphasizes interactive and process-oriented assessment. It also aligns well with the core purpose of formative assessment in that it involves establishing both what the learners can do on their own and what they can potentially achieve with support of others, through an ongoing scaffold process within which formative feedback is offered to support learners to close their performance gaps. Moreover, the ZPD relates to engagement with complex learning and assessment activities within social contexts to foster development of higher-order problem-solving and metacognitive skills that permits self-regulation desirable for independent thinking, transferable and life-long learning. As already illustrated and discussed earlier, these are fundamental in higher education and professional learning.

Formative assessment can be conceptualized as assessment *within* the ZPD (which is assessment *for* learning) as opposed to assessment *of* ZPD or assessment *of* learning that denotes summative assessment. Various authors (Allal, 2000; Ash & Levitt, 2003; Clark, 2010) have attempted to conceptualize formative assessment from the perspective of assessment within the ZPD. In explaining the concept of formative and summative assessment, Allal (2000) noted that formative assessment relates to assessment *within* ZPD which is integrated within teaching and learning processes to gather information about learners' progression and their responsiveness to variety of scaffolding techniques while summative assessment relates to assessment *of* ZPD which measures the learning that has taken place as a result of the teaching and scaffolding processes. Allal (2000) further emphasizes that formative assessment necessitate opportunities for ongoing interactions because the ZPD is created by social interaction; and also clarified that it is the current level of learner's capability that determines the type of interactions in which the learners get involved in and from which they can benefit. This implies that, assessment *within* the ZPD (formative assessment) is a developmental process that requires the learner to willingly take responsibility to self-regulate and use feedback to engage at more complex levels which in turn creates opportunities for further scaffolding. As Ash and Levitt (2003) illustrated (within a face-to-face context), ZPD is not static but evolving where the upper boundaries are constantly changing with the learner increasing independent competence at each successful level, hence ongoing expansion of the ZPD.

Formative assessment offers a strategy to operationalize ongoing expansion of the ZPD through offering opportunities for iterative establishment of the differences between the teacher and the learner's understanding of the learning goals and expected outcomes within an ongoing collaborative process in which meanings are negotiated (Ash & Levitt, 2003).

Formative assessment also enables ongoing monitoring, assessment and interpretation of the distance between the learner's current and potential level of intellectual development within the ZPD to inform desirable formative feedback and in turn expands the learner ZPD, that is "the student will [potentially] be able to operate autonomously in the original ZPD (thus making it no longer a ZPD, and creating a new ZPD further up the developmental gradient" (Yorke, 2003, p. 492). Accordingly, more effective formative assessment requires explicitly defined learning goals and expected outcomes, and feedback that is formative (Ash & Levitt, 2003; Clark, 2010; Yorke, 2003). Feedback is formatively effective if it supports the students to close their current performance gaps and create opportunities for further development. As Clark puts it "feedback becomes formative when students are provided with scaffolded instruction or thoughtful questioning that serve as a prompt for further inquiry, which then closes the gap between their current level of understanding, and the desired learning goal" (2010, p. 344). Similarly, Yorke (2003) suggested that expected performance is best guided by and measured against clear assessment criteria, and it is necessary to foster shared understanding of the criteria through opportunities for dialogue between the teacher and learners. Yorke also noted that formative feedback is a key determinant of effectiveness of formative assessment and is more productive when it is dialogic in order to create opportunities for better understanding of that feedback. The core purpose of formative assessment is thus to support the students to engage in an authentic activity developmentally through opportunities for dialogic formative feedback, within which the pre-existing ZPD is increasingly expanded to support further cognitive development. This implies that effective formative assessment goes beyond offering learning support (that assist the learner to accomplish the current task) to provide learning scaffold, that is, to create opportunities for more advanced inquiry (ability to engage in a more complex task).

Revealing the centrality of social interactivity and collaborations in formative assessment, Clark (2010) conceptualized formative assessment as 'assessment within the collaborative ZPD' which he defined as a "process based on high-quality interactions between teacher/student and crucially between peers" (p. 343). High-quality interactions relates to equality, honesty, collaboration, and reciprocity as a community that is bound by common goals in accomplishing an authentic activity in a particular domain (Clark, 2010). Such interactions lead to processes that stimulate learners to make their thinking visible to others, apply and share their existing knowledge and experiences, provide peers with critical feedback, and mutually learn from peers' ideas and work.

It is now apparent that assessment of situated and authentic learning is more effective when deeply embedded as an integral part of teaching and learning which is fundamentally aimed at promoting meaningful and transferable learning. This implies that effectively embedded assessment is a hallmark of effective teaching and meaningful learning in higher education. In the same vein, ongoing assessment within the ZPD closely aligns with the concept of online formative assessment as it emphasizes interactive and process-oriented assessment, which as Oosterhof et al. (2008) suggested is particularly crucial in online learning settings for sustaining productive engagement. Speck (2002) also suggested that online assessment of higher learning necessitates embedded process-oriented assessment approach that allows interplay between formative and summative assessment, and ongoing assessment of both processes and products because higher-order thinking skills cannot be adequately assessed in asynchronous settings without such a focus. Similarly, Oosterhof et al. (2008) further emphasized that ongoing documentation of both processes and products is particularly relevant in online learning settings due to the physical barriers, and it is therefore useful to offer means that enable students to make their learning and thinking processes visible to their peers and the teacher in order to sustain collaborative discourse and inform formative feedback processes. However, as Oosterhof et al. identified, accounting for processes that characterize authentic assessment activities is not obvious in online settings, and therefore it is necessary for online educators to devise innovative techniques to allow for ongoing documentation, monitoring and assessment of the processes involved.

Consistent with the theoretical perspectives articulated so far, the importance of embedded assessment in higher education has been well documented in the recent reviews of related literature (e.g. Gikandi et al., 2011; Young & Kim, 2010). However, with exception of Oosterhof et al. (2008), the theoretical perspectives reviewed above did not reveal specific attention to embedded assessment in online learning settings. This reveals a gap in theory of embedded assessment in online learning. Speck (2002) in reviewing related literature also identified this gap in explaining that,

Insufficient attention to pedagogical questions and concerns arising from the practice of on-line teaching quite naturally and logically raises questions about assessment of learners in on-line classrooms...In considering assessment, I take the position that if it is to be effective, assessment must be part and parcel of the entire learning enterprise and therefore is not a distinct stage of pedagogical theory. Assessment must be integrated into a holistic view of pedagogy. This means that any theory of assessment presumes and informs a theory of learning. Unfortunately, professors often assess students under the authority of an inchoate theory of learning. (Speck, 2002, pp. 5-6)

As Speck noted, a suitable theory on embedded assessment informed by relevant empirical evidence is desirable in order to provide online educators with a framework that would support them to make informed choices about effective formative assessment in online courses. Following critical analysis of the related literature including that reported in Chapter 2, it appears that there are only a few empirical studies (e.g. Mackey, 2009; Mackey & Evans, 2011; Russell, Elton, Swinglehurst, & Greenhalgh, 2006; Sorensen & Takle, 2005; Vonderwell et al., 2007) have focused on embedded assessment in online settings in ways that conform to the concept of formative assessment as conceptualized in this study. As discussed within this chapter, this study went beyond the aspects identified in these prior studies to richly illustrate the design and implementation of embedded assessment within the context of CPD particularly with respect to ongoing formative and summative assessment; and interactive formative feedback processes.

While the findings from the above-referenced related empirical studies reveal some commonality to the findings of the current study with respect to demonstrating some aspects that are consistent with the articulated theoretical perspectives, it is important to note that development of a theory for effective online formative assessment has to be more diverse and deeper than what each of the prior studies reveal separately. The current study conceptualized online formative assessment with a more holistic pedagogical strategy purposefully incorporating diverse elements. This research focused on exploring multifaceted aspects of formative assessment including provision of a variety of embedded authentic assessment activities which were interrelated and structured to engage the students within the online discourse and real-life contexts, interactive shared understanding of learning goals and expected outcomes, and ongoing monitoring, assessment, and opportunities for ongoing and dialogic formative feedback. Development of a theoretical framework in this study was aimed to coherently unify these diverse elements and techniques from the perspective of authentic learning; and thus explicate further how this created an effective pedagogical design to promote meaningful learning and ongoing assessment.

In order to adequately elucidate the key contributions of this study relative to the existing research noted above, the current findings are first re-examined with respect to the theories articulated above and then synthesized into a theoretical framework.

7.2.3 The theoretical framework for online formative assessment as process-oriented assessment within the ZPD

The theories of situated cognition and ZPD as articulated so far offer a unified theoretical basis to develop a theoretical framework from the findings of this study. These theories are applied to develop a theoretical framework that explicates how effective integration of formative assessment as illustrated in both online courses facilitated meaningful learning and its ongoing assessment through creating a synergy between the components of cognitive engagement and social interactions within the constraints imposed by a variety of ongoing authentic assessment activities. The findings of the current study reveal that situated and authentic learning can be enhanced by embedded assessment through ongoing authentic assessment activities with opportunities for social interactions. The evident meaningful learning and ongoing assessment was promoted through embedding authentic assessment activities which formed the basis for overlap and interweave between formative and summative assessment.

In this study, a systematic process-oriented assessment of situated and authentic learning was operationalized through online formative assessment. The ongoing assessment was achieved through embedding authentic assessment activities coupled with opportunities for learner autonomy, negotiated meanings, and ongoing documentation and sharing of learning and assessment processes and products including student-created artefacts. These opportunities in turn facilitated opportunities for ongoing formative feedback processes which provided the students with opportunities to improve their achievement over time as they self-regulated to use the feedback to achieve deep understandings (of learning goals and content) and improve their performances for summative assessment, as well as develop competencies that were transferable to their own professional contexts. Online formative assessment was therefore part of the embedded assessment of situated and authentic learning that facilitated process-oriented interactions among the learner, authentic assessment activity and the other participants (teacher and peers) within the ZPD. This in turn enabled collaborations in ongoing monitoring, assessment and formative feedback. As revealed by the following sample excerpts, the embedded authentic assessment activities, and related formative assessment processes were purposefully designed in both courses (by both teachers with reference to the curriculum) with the aim to facilitate ongoing assessment of situated and authentic learning within a social context.

I have deliberately thought of the assignments [ongoing assessment activities] as being situated in your own contexts and practices. (And expect that you will also be learning

informally from colleagues and others outside the course at the same time.)... (Teacher A, 'Chapter 7 Designing for learning (17-21 May) Facilitated by Student H' in online discussion forum, Case 1, 20 May 2010)

The authentic part in them [ongoing assessment activities] is probably participation component and action research project because that is where they put things in place and is very relevant to what they are doing in the [their own] classroom [as professional teachers]. But I think all of it is quite authentic to what they are doing because they are getting feedback from their peers... (initial interview with Teacher B, Case 2, July 2010)

The current findings showed that both teachers designed for situated and authentic learning within which they explicitly shared the purpose of the ongoing authentic assessment activities from the outset of their respective courses. This fostered collaborative engagement as individuals interacted with others within the processes of accomplishing the assessment activities while receiving formative feedback that supported them to self-regulate and close their performance gaps.

As shown in Table 7.1, the advanced theoretical framework comprises four fundamental conceptual elements of assessment of situated and authentic learning, namely: embedded authentic assessment activities, shared goals and ownership, emphasis on both processes and products, and collaboration in developmental scaffolding. The related guiding sub-elements are also identified. As well, the development of this framework is also focused on re-examining and synthesizing how these elements and sub-elements were operationalized in the current study, with a particular focus on online formative assessment. The framework also highlights the evident strategies and benefits with respect to promoting learning and development.

Table 7.1: Online formative assessment as process-oriented assessment of situated and authentic learning within the ZPD

Conceptual elements for assessment of situated and authentic learning		Guiding sub-elements for design and implementation in online courses	The operationalization manifested in this study	The underlying strategies for online formative assessment (as described in Table 6.1, Chapter 6)	Emergent meaningful learning experiences (see related evidence in Section 6.4.1)
1	Embedded authentic assessment activities (Allal, 2000; Barab et al., 2000; Oosterhof et al., 2008; Yorke, 2003; Young, 1995; Young et al., 1997)	Variety of ongoing and interrelated authentic assessment activities that are integrated within teaching and learning processes	<ul style="list-style-type: none"> • Provision of assessment activities that are open-ended and involve real-life applications • Activities that are complex to engage learners in multiple roles and sustain their cognitive engagement over prolonged period • Intentional overlap and interweave between formative and summative assessment activities • Activities that require and stimulate learners to apply their existing knowledge and experiences 	<ul style="list-style-type: none"> • Teacher engagement with formative assessment • The overlap and interweave between formative and summative assessment 	<ul style="list-style-type: none"> • Active cognitive engagement • Contextual • Reflective • Self regulation
		Activities that require and stimulate learner cognitive engagement both individually and collaboratively	<ul style="list-style-type: none"> • Variety of activities that are ongoing to provide multiple sources of evidence and provide opportunities for learners to demonstrate varying capabilities • Activities that require student to create own artefacts and demonstrate their capabilities individually • Collaborative activities that offer sustainable opportunities for collaborative learning and contextualization through emergence of multiple and diverse perspectives situated within (individual and/or broader) real-life experiences and contexts 	<ul style="list-style-type: none"> • Teacher engagement with formative assessment • The overlap and interweave between formative and summative assessment • Development of an interactive and supportive learning community (in each online course) with shared goals and responsibilities 	<ul style="list-style-type: none"> • Interactive • Collaborative • Contextual • Reflective
2	Shared goals and ownership (Ash & Levitt, 2003; Clark, 2010; Oosterhof et al., 2008; Yorke, 2003)	Learner autonomy	<ul style="list-style-type: none"> • Opportunities for choice of relevant activities to allow for multidimensional perspectives and contextualized learning • Flexibility within assessment guidelines and rubrics based on shared understanding of expected outcomes and emerging needs 	<ul style="list-style-type: none"> • Teacher engagement with formative assessment • Development of a learning community 	<ul style="list-style-type: none"> • Self regulation • Contextual • Active cognitive engagement • Multidimensional • Reflective
		Clarity of learning goals and expected outcomes from the outset of the course	<ul style="list-style-type: none"> • Clear assessment guidelines and analytical rubrics • Ongoing teacher guidance and modelling through offering illustrations and/or exemplars • Opportunities for negotiated meanings of the rubrics within the open discussion forums 	<ul style="list-style-type: none"> • Teacher engagement with formative assessment • Peer formative assessment • Development of a learning community 	<ul style="list-style-type: none"> • Interactive • Collaborative • Reflective
3	Emphasis on both processes and products	Process-oriented focus that emphasizes ongoing assessment of both	<ul style="list-style-type: none"> • Opportunities for dynamic and sustained interactions among the course participants (individual learner, teacher and peers) within the topical and open discussion 	<ul style="list-style-type: none"> • Teacher engagement with formative assessment • Development of a learning 	<ul style="list-style-type: none"> • Interactive • Collaborative • Reflective

Conceptual elements for assessment of situated and authentic learning		Guiding sub-elements for design and implementation in online courses	The operationalization manifested in this study	The underlying strategies for online formative assessment (as described in Table 6.1, Chapter 6)	Emergent meaningful learning experiences (see related evidence in Section 6.4.1)
	(Allal, 2000; Clark, 2010; Oosterhof et al., 2008; Young, 1995; Young et al., 1997)	processes and products	forums that fostered with shared understanding of goals and the development of an interactive learning community <ul style="list-style-type: none"> • Opportunities for ongoing documentation and sharing (publicity or openness) of learning and assessment processes and resulting artefacts including work in progress that fostered shared responsibility 	community	
		Interactive collaborations in ongoing monitoring and assessment of evidence of learning by self and others (teacher and peers)	<ul style="list-style-type: none"> • Shared responsibility within an interactive and supportive learning community in ongoing monitoring and assessment of progress and achievements for purposes of informing desirable feedback and further learning 	<ul style="list-style-type: none"> • Teacher engagement with formative assessment • The overlap and interweave between formative and summative assessment • Self formative assessment • Peer formative assessment • Development of a learning community 	<ul style="list-style-type: none"> • Interactive • Collaborative • Reflective
4	Collaboration in developmental scaffolding (Allal, 2000; Ash & Levitt, 2003; Clark, 2010; Yorke, 2003)	Ongoing formative feedback processes as means of scaffolding within ZPD - Shared responsibility in iterative and dialogic formative feedback processes in which the teacher and peers are sources of external feedback, and self assessment (self reflections) as source of internal feedback	<ul style="list-style-type: none"> • Teacher engagement in offering formative feedback to the students • Peer formative assessment - peer-peer review and formative feedback • Self assessment - opportunities for self monitoring and reflections • The strong sense of interactive online learning community with shared goals and responsibility facilitated synergy between external and internal feedback. This supported achievement of: (a) performance goals (what am I expected to do and can I demonstrate the expected capabilities?), and (b) learning goals (what am I capable of doing and how can I improve my competence?), thus revealing how effective online formative assessment promoted both learning and development characterized by ongoing expansion of ZPD as students developmentally engaged with the various ongoing authentic assessment activities. 	<ul style="list-style-type: none"> • Teacher engagement with formative assessment • The overlap and interweave between formative and summative assessment • Self formative assessment • Peer formative assessment • Development of a learning community 	<ul style="list-style-type: none"> • Interactive • Collaborative • Reflective • Contextual • Self regulation • Active cognitive engagement

The findings from this research show that provision of a variety of ongoing and authentic summative and formative assessment activities enabled operationalization of the four fundamental conceptual elements (and related sub-elements) of assessment of situated and authentic learning. The learner autonomy that was inherent within these assessment activities provided students with opportunities to choose relevant activities that also aligned well with their own goals, and needs. Notably, the students in this study were continuing professionals which offered them enriched opportunities to capitalize on learner autonomy and engage with activities that were situated within their own professional practices and contexts. The assessment activities also required the students to apply various abilities and skills which prompted them with opportunities to draw on their prior knowledge and experiences. The evident authenticity stimulated valuable processes as the students engaged in constructive dialogue with others (within and/or beyond their online learning community) as they exchanged ideas/resources, sought and/or provided feedback to peers in the process of accomplishing the assessment activities. This in turn, prompted contextualized dialogue characterized by diverse perspectives emerging from students as they shared their lived experiences as continuing professionals, which prompted reflectivity as individuals attempted to compare and evaluate these against their peers' perspectives. Indeed, such processes inherently embodied ongoing process-oriented assessment.

The overlap and interweave between formative and summative assessment stimulated active and interactive collaborations amongst the individual student, teacher and peers as a learning community with shared goals and responsibility. These opportunities fostered shared authenticity and meaningful learning experiences that were emergent from learners' engagement with authentic learning and embedded assessment activities with opportunities for socially negotiated meanings and ongoing scaffolding. The evident productivity resulting from collaborative engagement in learning and ongoing assessment demonstrates assessment of situated and authentic learning environments as a collaborative endeavour that is enhanced through shared authenticity. That is, shared authenticity emerges through engagement in an authentic activity within a social context that allows participants to actively collaborate as they construct, share, negotiate, evaluate and validate meanings, from which individuals reconstruct interpretations in ways that is meaningful within their own conceptual knowledge structures. This implies *designing for shared authenticity* is more productive as compared to attempting to *pre-authenticate* the learning environment because it promotes meaningful

learning experiences and learner's development that are emergent from the social interactions-on-authentic activity.

The ongoing authentic assessment activities and the inherent formative processes in this study promoted and sustained students' engagement with meaningful processes and learning experiences both individually and collectively. It is through engagement with these activities that the meaningful learning experiences emerged (as depicted in Table 7.1), which included: active cognitive engagement, contextual, interactive collaborative, multidimensional perspectives, reflective and self regulation. As identified earlier in the reviewed literature, these experiences are critical in professional learning particularly in teacher education because teachers need to engage meaningfully in ways that support them to develop both content knowledge and other relevant professional skills (Correia & Davis, 2008; Mackey, 2011) in the light of transferable and life-long learning that is desirable in the rapidly changing knowledge societies (Davis, 2008; Gillard et al., 2008).

As indicated in Table 7.1, various strategies supported the emergence of the illustrated meaningful learning experiences. These strategies comprise various techniques, such as the analytical rubrics that supported the sharing of goals and expected outcomes, and assessment towards their achievement. Other techniques included the topical and open discussion forums, and the enabled ongoing documentation and sharing of processes and student-created artefacts which were useful in facilitating ongoing monitoring and assessment of both the processes and products. This in turn, fostered collaborations in ongoing formative feedback as a means of scaffolding learning and development that was characterized by immediacy, and opportunities for ongoing interactions making feedback an iterative and dialogic process that triggered self-reflections and scaffolded further inquiry. This prompted self-regulatory strategies in pursuit of solutions to the newly identified focus for further inquiry, thus ongoing expansion of the ZPD.

The immediacy, interactivity and adequacy of formative feedback manifested the effectiveness of formative assessment in this study. Ongoing documentation and openness of evidence of learning was a key aspect that contributed to this effectiveness. It offered the teacher enriched opportunities to engage with and reflect upon students' evidence of learning and in turn offer adequate and tailored formative feedback. In addition, ongoing documentation and openness increased opportunities for self and peer formative assessment, through facilitating internal feedback (self-reflections) as students had sufficient opportunities

to review and reflect upon the feedback that they received from the teacher and peers, while at the same time giving them sufficient time to review and rethink upon previous contributions before providing feedback to peers. This resulted in feedback that was deeply thought and constructive, which in turn fostered meaningful dialogue.

The ongoing documentation and openness of learning and assessment processes and products also increased the uptake of peer-peer feedback as it enabled the students to make their thinking visible to others through articulating their learning strengths and needs. This elicited formative feedback that was tailored to the individual's needs, thus prompting students to initiate dialogue about that feedback which influenced the eventual acceptance and/or reconstruction of the feedback. Moreover, this offered them opportunities to interact with peers' feedback in ways that prompted them to compare their thinking and/or work with that of peers, which in turn stimulated them to revise their learning strategies in order to achieve desired performances. These aspects reveal the importance of ongoing documentation and publicity of processes and student-created artefacts (including work in progress) in enhancing formative feedback in ways that promote meaningful dialogue, reflectivity and self-regulation, which are particularly critical for effective online learning.

It was evident that opportunities for self, peer-peer and teacher formative assessment facilitated a valuable link between internal and external feedback, which supported the students to better internalize external feedback (from the peers and teacher) as they constructed their own meaning of the feedback and intentionally used it for productive improvements. The opportunities for ongoing formative feedback while engaging in the ongoing authentic assessment activities supported students to develop self-regulation and metacognitive dispositions as they engaged in ways that stimulated further inquiry. This indicates that the divergent approach to assessment in both courses supported expanding ZPD; in ways that increasingly enabled students to go beyond achievement of performance goals (what they were expected to do as part of summative assessment requirements) to pursuing learning goals. That is, keenness on how to improve own competencies for use in their professional practice.

These outcomes confirm that the ongoing formative feedback promoted deep learning; and indicates that contextualization of assessment activities inevitably reduced the gap between learning for transfer, and performing to demonstrate knowledge for both formative and summative assessment. Self-regulated learning dispositions supported learners to take

primary responsibility for their own learning and develop new (or improve) their competencies, as well as increasingly transform their identity both individually and as a group. It was evident that the emergent learning experiences supported meaningful learning as manifested by how the students critically reflected on what and how they were learning, and made contextualized connections. This manifests enhanced ability to transfer learning to own professional practice and development of life-long learning dispositions.

The current study showed that effective online formative assessment promoted meaningful reflectivity that was often characterized by three processes in which students were able to return to experiences, attend to feelings and re-evaluate their experiences. Various researchers have articulated these three sub-processes (returning to the experience, attending to feelings, and re-evaluating the experience) in conceptualization of a meaningful reflective process within the context of professional learning (Boud, 2006; Boud, Keogh, & Walker, 1985; Boud & Walker, 1998). According to Boud (2006), and Matthew and Jessel (1998), these processes manifest meaningful reflectivity that goes beyond reflecting upon one's learning to revealing reflexivity (reflection in the context of practice) which may support professional teachers as learners to apply their learning in their professional practices, and become reflective practitioners and life-long learners. As illustrated within Section 6.4.1, the findings of both cases revealed such reflective processes as students constantly returned to the experience through publicly debriefing their progress in accomplishing the formative assessment activities as well as articulating their developing understandings of content and abilities. Students were also able to accommodate the positive and negative feelings about their learning experiences within the course by constantly narrating their lived experiences as both learners and professionals. The findings further reveal that the students were also able to re-evaluate self and/or peers' learning experiences and integrate new knowledge into their conceptual framework. This was manifested through their constant articulations of how varying learning experiences amongst the course participants had exposed them to multiple and diverse perspectives that shifted their thinking and perceptions. This in turn stimulated students to consider alternative perspectives and motivated them to explore and/or try out new possibilities. In these ways, providing learners (particularly as professional teachers) with opportunities for sharing their existing knowledge and lived experiences supported them to learn more meaningfully as they articulated and reflected upon issues affecting their daily

practice within a supportive online learning community, and discerned what they could transfer to their own professional practice.

The opportunities for dynamic and sustained interactivity were vital in sustaining productive learners' engagement with the authentic assessment activities in both online courses. The sustained meaningful interactions and collaborative processes among the self, peers, and the teacher as a supportive online learning community enhanced the opportunities for shared understanding of learning goals and expected outcomes, and ongoing and interactive formative feedback in both courses. The development of an effective learning community with shared goals and responsibility increasingly stimulated the students to become mutually responsible for their own and peers' learning and assessment. The emergent learning community fostered meaningful dialogue that immensely enriched the discourse with divergent perspectives and expanded opportunities for immediate and critical formative feedback. Within these processes, learners were able to build new interpretive frameworks through adopting perspectives that were meaningful and relevant to their own contexts.

In summary, the theoretical framework advanced from the findings of this study conforms to situativists' perspectives that, "authentic activity... is important for learners, because it is the only way they gain access to the standpoint that enables practitioners to act meaningfully and purposefully... activity also provides experience, which is plainly important for subsequent action" (Brown et al., 1989, p. 36). Similarly, the theoretical framework is consistent with the notion of 'assessment within the collaborative ZPD' which emphasize "sustained dialogue [that] is characterized by on-task interaction through which students may consider the perspectives of others, resolve conflicts, and mediate learning during collaborative problem solving" (Clark 2010, p. 346). This implies that the integration of ongoing authentic assessment activities situated within social and realistic contexts facilitated a dialogical scaffolding structure in both courses from which valuable learning experiences emerged. Such experiences included the development of an interactive and supportive community within which both the teacher and learners were stimulated to actively collaborate in ongoing formative assessment. Sustained interactive collaborations and ongoing scaffolding were evidently critical in sustaining productive engagement in the studied online learning settings. Consistent with the literature reviewed in Section 2.2 (e.g. Garrison, Anderson, & Archer, 2000; Härmäläinen & Häkkinen, 2010; Hiltz, 1995; Mason & Bacsich,

1998; Prins et al., 2005; Salmon, 2004), this suggests that online formative assessment underpinned by CSCL was key in promoting productive interactions and collaborations.

Moreover, the theoretical framework advanced from this study reveals appropriate alignment between formative assessment (assessment within the ZPD) and summative assessment (assessment of ZPD) through explicating how they interweaved in beneficial ways to enable the ongoing assessment of situated and authentic learning. Online formative assessment as *assessment within the collaborative ZPD* involved process-oriented assessment of the learners' developmental progress in relation to the learning goals and expected outcomes through shared responsibility in ongoing monitoring, assessment and provision of desirable formative feedback. This in turn supported students to increasingly enhance their achievement in summative assessment which involved the *assessment of ZPD* for the individual students in each of the various ongoing and interweaved authentic assessment activities, which were eventually aggregated into their overall grade in their respective course. Thus, effective online formative assessment is as a function of a developmental process within the collaborative ZPD in which ongoing authentic assessment activities, shared learning goals, ongoing monitoring and interactive formative feedback are at the centrality.

7.3 The key contributions of this study

The current findings showed that engaging students with authentic assessment activities for both formative and summative assessment purposes can promote meaningful learning. This is consistent with recent studies (Mackey, 2009, 2011; Mackey & Evans, 2011) within the context of continuing online professional development for teachers at postgraduate level who reported that engaging students with authentic learning and assessment activities promoted meaningful and transferable learning. Mackey's findings demonstrated that embedding authentic assessments that are situated with social and real-life professional contexts can promote meaningful learning that is transferable to own professional practice and contexts. The current study also showed that provision of authentic assessment activities that were appropriately complex stimulated ongoing on-task interactions as the students engaged with their peers within the online discourse in the process of accomplishing the expected outcomes. The emergent peer-peer engagement was characterized by sharing of diverse perspectives, and contextualized and reflective dialogue as the students connected the online discourse to their assessment work (authentic projects) that was situated within their professional practice

environments. The interactivity within the asynchronous online discourse offered the students valuable opportunities to engage in critical dialogue and reflection about their understanding of content while making connections to their own professional practice.

Similar to Mackey's studies (Mackey, 2009, 2011; Mackey & Evans, 2011), findings of the current study confirmed that the open-endedness and learner autonomy that characterized the authentic activities prompted the students to go beyond the assessment requirements to self-regulate in pursuit of their own learning goals that aligned with their professional needs and interests. Through such opportunities the students as professional learners were able to develop and confidently demonstrate their capabilities in ICT as the subject domain, and transform their identity as professional experts in regard to applying ICT in their own professional practice. The findings of the current study further demonstrated that mutual engagement within the constraints afforded by authentic tasks resonates with culture of real practices which engage learners in complex problem solving, and in turn support them to develop skills that are relevant and transferable to their real-world professional settings. These findings are also consistent with Mackey's studies.

It is important to point out that Mackey's studies were in a similar context with the current study in that both studies were situated within the same university's postgraduate programme in related online courses within the context of ICT-related professional development for teachers, however, these studies differed in their specific focus. The current study mainly focused on researching classroom contexts with particular interest on how application of online formative assessment can enhance meaningful learning and its assessment. Mackey's related studies were mainly focused on how students were transferring their developed competencies and skills to their real-life professional settings particularly in regard to how their experiences in online learning communities and communities of practices interconnected. As illustrated in Chapters 4 and 5, and re-examined in Section 6.4.1, the current study illuminates rich evidence about the online classroom interactions and formative assessment processes that supported meaningful learning experiences as a manifestation of transferable learning.

Therefore, unlike Mackey, the current study explored in-depth the learning and assessment activities and processes within their naturalistic contexts which provided rich evidence about how ongoing authentic assessment activities coupled with the learner autonomy and adequate opportunities for negotiating meanings of learning goals and expected

outcomes promoted meaningful learning and opportunities for effective formative feedback. Through observations and analysis of the archived course discourse, the current study went further to uncover the nature of learning and formative assessment processes within the online discourse that supported the students to productively engage with authentic assessment that were situated in real-life contexts. The current findings illustrated that the authentic assessment activities and learner autonomy were not mutually exclusive, instead, they were tightly interlinked resulting to a synergy that fostered shared authenticity. The findings further indicate that shared authenticity that emerged from opportunities for negotiated meanings within the online course discourse promoted shared ownership, expertise and responsibility among the students and the teacher. These in turn promoted interactivity, contextualization and reflectivity within learning and assessment processes, which is a manifestation of deep and transferable learning. For instance, this emerged strongly in both courses as students engaged with the authentic projects that were situated in real-life contexts while having opportunities to engage in meaningful dialogue with others online.

Through the in-depth analysis of learning and assessment processes in both online classroom settings, the current findings also revealed how authentic assessment activities stimulated the students to apply their existing knowledge and experiences as knowledgeable professionals, thus fostering contextual learning and opportunities to engage in meaningful online dialogue in ways that prompted critical thinking and rich peer formative feedback, as well as stimulating students to connect and apply their learning to own professional practice and other real-life contexts. This study also showed that productive engagement with authentic activities necessitates opportunities for ongoing monitoring, and interactive formative feedback in order to foster shared understanding of learning goals, and provide desirable learning scaffold to ensure that the inherent complexity that often characterizes authentic activities does not result in learning barriers. Russell et al. (2006) within the context of continuing health science online education at postgraduate level also demonstrated the importance of engaging students in embedded authentic assessment as a means of promoting meaningful and transferable online learning. Russell et al.'s study also highlighted the necessity to offer students opportunities to mutually engage with peers, and offer constructive peer-peer feedback in the process of accomplishing the authentic assessment activities.

The current findings showed that it is important for online educators to recognize diversity among learners in relation to their previous experiences and learning needs including

their capabilities to actively and productively engage with others online, and thus necessity to provide learning support that recognizes and responds to their diverse needs. Both teachers in the current study recognized that their students had varying backgrounds, capabilities and needs, and this prompted these teachers to offer some individualized support. This is consistent with the findings of Russell et al. (2006). However, the current study went beyond Russell et al.'s study to reveal the need for teachers to maintain an optimal blend between private interactions (for instance, through emails) and public interactions (within open online discussion forums) between the teacher and the students in order to provide adequate opportunities for students to voice their learning needs and elicit formative feedback.

Russell et al. (2006) conceptualized ongoing assessment of higher-order learning as part of effective teaching and learning. Their study was underpinned on constructivist theoretical perspectives in which they emphasized that assessment in online settings necessitates a focus on both processes and products of learning, and active involvement of learners within learning and ongoing assessment processes as a way to promote active knowledge construction. Consistent with the current study, Russell et al. showed that the assessment activities require to be accompanied by clear assessment criteria in order to promote shared understanding of learning goals and expected outcomes. Their study is similar to the current study in identifying that formative feedback is more effective when it is dialogic and a shared responsibility among the students and the teacher. However, Russell et al.'s (2006) study present their findings as a narrative case study in which they shared their experiences in two online courses as teachers but the scope of their study did not include an exhaustive account to illustrate the nature of the online classroom interactions, and ongoing formative assessment processes that occurred among the course participants. While Russell et al.'s study is substantially informative, it did not adequately permit to draw all the relevant insights on the nature of interactions and collaborations that characterized effective on-task interactions and ongoing formative feedback processes.

The current research illustrates use of asynchronous online discussion as a technique for facilitating formative assessment which concurs with a study by Vonderwell et al. (2007) who studied five online educational courses at postgraduate level. Consistent with the current findings, Vonderwell et al. (2007) emphasized collaborative learning and process-oriented assessment in which learners were prompted as active participants in their learning and its ongoing assessment. Vonderwell et al. investigated students' learning experiences within the

asynchronous online discussions and demonstrated use of asynchronous online discussions as a technique for facilitating ongoing formative peer and self assessment. Similar to the findings of both cases in the current study, their findings showed that online environments provided enhanced opportunities for students to self assess and offer constructive peer-peer feedback. The current findings also confirm Vonderwell et al. (2007) in showing that the asynchronous threaded discussions promoted reflective learning and self assessment through allowing students to have adequate time to review peers' thinking, and compose and reflect upon their thoughts about their own understanding of content before sharing their thinking or responding with other online participants. In these ways, collaborative learning and assessment promoted reflective inquiry and enabled opportunities for dynamic and meaningful interactions, multiple perspectives, and shared understanding of content as a learning community with common goals. Findings from both Vonderwell et al. (2007) and the current study also demonstrated that permitting learner autonomy within the online discussion stimulate learners to actively participate within collaborative online discourse in productive ways.

The findings of the current study are also similar to Sorensen and Takle's (2005) study which was framed within collaborative learning to supports learner centred focus and process-oriented assessment in which students were actively engaged as co-facilitators and participants. Sorensen and Takle's study included two online courses, one in physical science education at undergraduate level and the other in instructional design at postgraduate level. Similar to the findings of the current study as well as those by Vonderwell et al. (2007), Sorensen and Takle's study also demonstrated use of asynchronous online discussions as a technique that supported ongoing assessment for both processes and products of learning. Confirming their findings, the current study also showed that effective integration of formative assessment in online learning environments has the potential to offer an appropriate structure for sustained meaningful interactions among learners and the teacher, and foster development of interactive and collaborative learning communities in ways that promote self and peer-peer formative assessment.

Consistent with the current study, research by Vonderwell et al. (2007), and Sorensen and Takle (2005) emphasize that assessment in online higher learning should be ongoing and encompass both processes and products in order to enable assessment to inform teaching and contribute to learning. These studies also demonstrated that active interactive collaboration among the students and the teacher in learning and ongoing assessment as a means to

stimulate students to perceive themselves as capable learners and assume primary responsibility for their learning.

The findings of the current study also conforms to those of Sorensen and Takle (2005), and Vonderwell et al. (2007) in showing that it is necessary to go beyond individual involvement to consider collaborative engagement in development and negotiation of meaning within social context. It is important to note that although findings from this study were relatively similar to those from Sorensen and Takle (2005), and Vonderwell et al. (2007), evidence from the current study was considered richer because in their respective studies they did not go further to illuminate the nature of learning and assessment activities on which the interactions were based. Unlike the current study that illustrated engagement with a variety of authentic assessment including authentic projects that were situated in real-life contexts, the nature of interactions revealed by Sorensen and Takle (2005), and Vonderwell et al. (2007) Vonderwell et al. (2007) only illuminated learners' engagement with content and formative feedback processes within the collaborative online discussion forums in which active participation and meaningful engagement with peers and the teacher was emphasized.

The current findings further showed that online environments can provide dynamic opportunities for sustained interactions among learners in way that enable them to productively share their ongoing assessment work, views and experiences. Additionally, the current findings illustrated that through opportunities for sustained interactions with others, both the teacher and learners alike were involved actively as knowledge resources through shared responsibilities in facilitating collaborative learning and ongoing assessment within which the online discussion forums were utilized innovatively to support various formative assessment techniques. Integrating of formative assessment within each online course fostered a sense of an interactive and collaborative online learning community, which provided learners with diverse opportunities for dynamic and meaningful interactions with others (particularly the teacher and peers). For instance, as illustrated in Chapter 4 through 6 such opportunities offered a means of facilitate collaborative formative assessment of both processes and products of learning within both courses. Through these formative processes, student participation, motivation and ownership of learning were enhanced.

The current study went further to provide explicit evidence on the nature of the interactivity within collaborative feedback processes as illustrated within individual cases using network diagrams (see Figures 4.6 and 5.4) which reveal how situating learning and

assessment within social contexts expanded opportunities for enriched formative feedback in terms of interactivity, immediacy and adequacy. These forms of interactions provided opportunities for ongoing monitoring and formative feedback as learners engaged in various authentic learning and assessment activities.

The current study illustrated that online settings can offer enhanced opportunities to provide more detailed and clearly written feedback that is integrated within student assessment work. This was previously identified by Wolsey (2008) whose study focused on analyzing the efficacy of teacher's formative feedback on students' submitted work on specific assessment activities within postgraduate online courses for teachers. Like Wolsey (2008), the current study identified these aspects as critical in online settings in stimulating meaningful dialogue between the teacher and the learner. The current study as well as Wolsey (2008) also demonstrated that interactive formative feedback is essential in order for feedback to serve as a means of scaffolding learning that support learners to improve their subsequent learning strategies and close their performance gaps. This study also confirms Wolsey in identifying that formative feedback is effective when characterized by immediacy (timeliness), which relates to feedback that is given at or close to the time the learning occurs, as well as providing opportunities for the students to repeat and/or revise their work.

While Wolsey (2008) specifically focused on efficacy of teacher's feedback on submitted assessment work in which he did not go further to illuminate the nature of assessment activities involved, the current study went beyond to demonstrate that applying variety of techniques in online formative assessment can foster opportunities for effective feedback. These additional techniques relates to: students' engagement within collaborative online discussions as they engaged with various interrelated authentic assessment activities including authentic projects that were related to real-life applications, ongoing sharing and documentation of learning and assessment processes, and shared responsibility among the students and the teacher in ongoing monitoring, assessment and provision of formative feedback. Both case studies illustrate productivity that emerged by incorporating such different techniques, and in particular increased the quality of formative feedback in relation to its immediacy, interactivity and adequacy. Shared responsibility in ongoing formative feedback processes as one of the applied techniques in both courses was also vital in stimulating students' active participation and ownership of their learning and its assessment in ways that promoted self-regulation and metacognitive skills. The key characteristics

underlying evident effectiveness of online formative assessment are illustrated within individual case findings and further synthesized in Section 6.4.4.

Another finding in the current study that is consistent with Wolsey (2008) is that, clear, timely, ongoing and adequately detailed formative feedback is important in online environments due to physical interaction barriers among online participants, which may discourage or limit some learners to seek clarity. Similar to the current findings, Wolsey (2008) also illustrated that indirect feedback, such as offering references and hints, as well as asking leading questions, facilitates student's development and achievement by encouraging the student to self-correct and to engage in reflective inquiry. These aspects manifest effective formative feedback that promotes student motivation towards self regulatory processes and confidence to demonstrate their capabilities.

The current research as well as that by Wolsey (2008) indicated that it is essential that the teacher share rubrics with the learners and provide exemplars where applicable in order to achieve openness and transparency of rubrics, and to support the formative feedback processes. Consistent with the findings of Wolsey (2008), the current study illustrated that online environments offered flexible opportunities to share and review rubrics thus promoting rubrics' openness and flexibility. However unlike the current study, Wolsey (2008) did not illustrate how sharing of meaning of rubrics and exemplars was achieved. The current study explicitly demonstrated processes of how sharing of goals and expected outcomes were achieved through use of analytical rubrics and exemplars, including opportunities for sharing their meanings. Another notable finding in the current study is that openness of students' work in progress to peers served as valuable exemplars. This openness was enabled through opportunities for ongoing documentation and sharing of learning and assessment processes and products that also included publicity of learning needs and received feedback which enhanced effectiveness and efficiency of feedback, and clarity of the expected outcomes.

Consistent with the evidence obtained in the current study, Wolsey (2008) identified that "feedback is tied to specific criteria...and an indication of how to close the gap between the current and expected performance" (2008, p. 313). The current findings demonstrated that formative feedback is effective when it is timely and supported by a well-designed rubrics coupled with opportunities for interactions about that feedback in order to support the student better understand the feedback. This is also consistent with the findings of Gaytan and McEwen (2007). Unlike the other prior studies referenced here, the study by Gaytan and

McEwen (2007) was designed as a survey while the other studies applied case study design with a bias in variety of qualitative methodological techniques such as observation, analysis of online course discourse, and interviews. Gaytan and McEwen's (2007) study entailed an online survey that included 85 online educators and 1,963 students enrolled in different online courses (and programmes including education, business, arts, sciences, at both undergraduate and postgraduate level) offered in two different universities during a particular semester. Albeit the identified differences in methodological approach, the current findings confirm the findings of Gaytan and McEwen (2007) in identifying that effectiveness of feedback is closely linked to offering opportunities for frequent and meaningful interactions to enable shared purpose and meaning of learning goals and expected outcomes. It is through such processes that formative feedback can be effective in supporting and scaffolding learning towards achievement of targeted goals. Similar to the current study, Gaytan and McEwen's findings also indicate that ongoing formative feedback as a vital element in online assessment. Further, agreeing with the findings of Gaytan and McEwen, the current study demonstrated that interactivity among online participants influence the effectiveness and efficiency of formative feedback. The current study further showed that analytical rubrics and opportunities for ongoing interactions are integral to the teacher being explicit in sharing the purpose and understanding of expected outcomes.

The current study illustrated the importance of integrating a variety of ongoing assessment activities and utilizing different techniques in order to provide learners with diverse opportunities to develop and demonstrate their knowledge. The current study also found that effective online assessment necessitates provision of various ongoing activities that encompass different techniques such as engaging students with authentic projects, self assessment tasks and asynchronous collaborations within online discussions forums. The findings of Gaytan and McEwen (2007) are consistent with the current study in regard to this aspect. Like Gaytan and McEwen, the current findings showed that provision of variety of ongoing assessment activities can facilitate multidimensional approaches. In the current study, the findings of both cases illustrated that such approaches fostered learner autonomy and meaningful engagement through enabling diverse opportunities for learners to apply varying approaches and learning strategies in their learning and development of the expected artefacts as a means to demonstrate their capabilities and enhance their competencies. As Gaytan and McEwen identified, the current findings also illustrated that provision of variety of ongoing

assessment activities coupled with clearly shared goals and expected outcomes, and opportunities for dynamic interactions can foster opportunities for self and peer formative assessment that leads to meaningful engagement and timely interactive formative feedback.

Although the findings by Gaytan and McEwen (2007) are agreeably consistent with the current findings, the nature of their study based on the survey design does not provide information to illustrate how such elements may be operationalized effectively in online classroom settings. The elements identified by Gaytan and McEwen were illustrated in depth in the current study through illuminating learning and assessment activities and related formative processes as they occurred in both online courses in which the provision of a variety of authentic assessment activities was illustrated as a key component in embedded assessment, coupled with clarity of learning goals and expected outcomes, and opportunities for ongoing monitoring, assessment and interactive formative feedback in which development of an interactive learning community with active learners' involvement was at the centrality.

It is noteworthy that in addition to the identified relationship between the current findings and previous research discussed above, the current study went further to utilize a more holistic approach within online classroom contexts through systematically investigating and explicating the various strategies of formative assessment which encompassed overlapping elements and techniques that were utilized in operationalization of embedded assessment of situated and authentic learning. As key contributions of this study, a number of new strategies and techniques were identified and illustrated in individual case findings and re-examined in Section 6.4.2 and 6.4.4. These innovative strategies and/or techniques included an interweave between formative and summative assessment, ongoing sharing and documentation of learning and assessment processes and products including individual students' assessment work in progress, and the emergent synergies that resulted from active and collaborative engagement among teacher, self and peer with shared responsibility in formative assessment processes. One of the emergent synergies was the development of a robust, interactive and supportive learning community with shared goals, ownership and responsibility which reciprocally enriched formative processes as the students became mutually responsible for their own learning and assessment as well as that of their peers. The evidence obtained from multiple sources, as reported earlier, showed that the students in both cases recognized their peers as a source of valuable feedback.

Another important synergy in the current study relates to how the opportunities to interact with others within individual reflective processes, dialogic feedback and meaning making resulted to a constructive link between internal and external feedback. This in turn supported the student to better understand and internalize external feedback, and use it to self regulate for productive improvements. For instance, the analysis of the content from the archived online discourse in both cases illustrated that opportunities for self assessment through reflective articulation of individual's developing understandings of content and expected outcomes, and their learning experiences as online learners provided the teacher and peers alike with enriched information to better understand the learning strengths and needs of individual students that in turn informed desirable formative feedback. In this way, self-reflections (internal feedback) prompted tailored external formative feedback which enhanced opportunities for dialogue about that feedback. The analysis of the online discourse and participants' interview transcripts in both courses further showed that opportunities for dialogue supported student to better understand and construct their own meanings of the feedback they received which inevitably increased its uptake and productivity in supporting them to revise their learning strategies and improve their performance. Such a synergy between self and peer formative assessment emerged more richly in students' reflective journals as used in Case 1 (Course 1). The use of open reflective journals in that online course provided students with opportunities to directly elicit external feedback from others (both the teacher and/or peers) as students self assessed and shared their progress and achievements. As illustrated in Chapter 4 (see Figures 4.8 and 4.9), the aspect of reflective journals being open implied that the individual student's journal was public to both the teacher and peers in ways that allowed the course participants to interact with and provide external feedback on self reflections. Such opportunities stimulated meaningful reflectivity and interactivity within formative feedback processes. In these ways, the current study demonstrates that applying a holistic approach that incorporates multifaceted techniques in the operationalization of embedded assessment can enhance meaningful learning and its ongoing assessment.

To conclude, it is apparent that framing the current study within online classroom contexts for the entire courses' duration and utilization of multiple data collection techniques provided the researcher with opportunities to gather rich evidence. This was particularly useful in revealing the nature of interactions within learning and formative assessment processes that occurred in both courses. In addition, this offered adequate opportunities to

explore the multifaceted variables that contributed to the effectiveness of online formative assessment in both courses. In these ways, albeit being a case study that compels analytical consideration of particularity of the research context, the current research provides useful illustrations on how to integrate ongoing assessment into teaching and learning processes. Moreover, the current findings reveal some relationships with the identified previous empirical studies in ways that indicate that the current findings confirm previous research. Notably, these relationships also appear to reinforce the theoretical framework advanced and synthesized in Section 7.1.3.

Chapter 8

8.0 Implications and conclusions

8.1 Introduction

This chapter starts by reviewing the context and significance of this study to refresh the readers on the relevance of this study and the gaps that this research sought to address. The findings of this research illustrate that formative assessment has a potential to increase the quality of online CPD as it continues to grow. This chapter also presents a synopsis of the findings of the two case studies of online courses that used embedded assessment before the key characteristic of the embedded assessment, which was a variety of ongoing authentic activities that build on one another throughout the course duration and were interweaved for both formative and summative assessment purposes. Ongoing monitoring and interactive formative feedback were also key formative processes within the embedded assessment. The chapter also outlines how the findings fit with the broader literature identifying the original contributions. Implications for practice and conclusions are then drawn based on the key findings. The chapter concludes by articulating the study limitations/delimitations and offering recommendations for future research.

Review of the wider context and significance of this study

Online and blending learning in higher education is growing fast worldwide (Akyol, Garrison, & Ozden, 2009; Khare & Lam, 2008), with online CPD programmes increasingly gaining prominence in many fields including teacher education (Mackey & Evans, 2011). Higher education institutions particularly universities in NZ and worldwide continue to face the challenge of designing customized learning environments to support committed continuing professionals to achieve their educational goals (Davis & Zaka, 2011). Practicing teachers are increasingly seeking online higher education to enhance their ICT knowledge and skills (Owen, 2011). CPD for teachers both in formal (Kirschner & Lai, 2007; Lai et al., 2006; Mackey, 2011) and informal online settings (Crane field, Yoong, & Huff, 2011; Lai et al., 2006; Owen, 2011) has the potential to positively impact on the quality of teaching, and thus students' achievements. Owen (2011) underscores the importance of personalized and contextualized learning environments in CPD programmes which “needs to offer flexibility of choice, time and approach, and to value personal theories and experiences” (Owen, 2011, p. 61) as a way of promoting meaningful learning. This can support professional learners to develop transferable knowledge and skills for increased professional competencies and life-

long learning. This may be facilitated through adopting pedagogical designs that stimulate learners to apply their prior knowledge and experiences in ways that support them to go beyond achievement of standardized course goals to meeting their own learning interest and needs (Davis & Zaka, 2011; Mackey, 2009, 2011). As highlighted in Section 2.2 and confirmed by the current findings, CSCL is a core approach that supports such desirable pedagogical designs and strategies.

As introduced in Chapter 1, assessment is a key element in higher education, whether in online and face-to-face learning. The increasing growth of CPD within online settings indicates the need for rich understandings into how assessment of situated and authentic learning can be designed to increase productivity in professional online learning. Although there is substantial research with focus on authentic activities to meaningfully engage professional learners (Mackey, 2009, 2011), there is limited research with a focus on assessment in professional online learning. As its contribution to further knowledge in this field, the current study has exemplified online formative assessment as an innovative pedagogical strategy to support meaningful learning and assessment within the context of ICT-related CPD for teachers.

8.2 Synopsis of the findings and contributions of this study

The purpose of this study was to explore integration of formative assessment in two online courses as a means of enhancing learning within the context of ICT education for continuing teachers. Following this two-case study, the research findings suggest that integration of formative assessment promoted valuable learning experiences. Both teachers embedded a variety of authentic assessment activities within teaching and learning processes which were ongoing throughout the course duration for both formative and summative purposes. These authentic assessment activities were interweaved to inform and build onto each other. Both case studies illustrate that the ongoing formative processes promoted meaningful learning experiences through sustained engagement in authentic activity within which interactive formative feedback was an ongoing developmental process. The opportunities for ongoing interactive formative feedback supported students to productively engage in ways that promoted self-regulated and deep learning. It became evident that students were increasingly stimulated to go beyond achievement of what they were expected to accomplish for summative assessment purposes to develop and/or improve competencies that were transferable to their own professional practice and contexts. It is also important to note that towards the end of this academic year of 2010 an earthquake in the region disrupted life in

September, which was one month before the end of the courses. Although this interrupted the University's normal operations for 2 weeks including on-campus programmes, the disruption was minimal given the online nature and the flexibility of the course designs, and therefore there was little or no impact with respect to the findings of this research.

It is also important to note that the two courses had many similarities including being part of the same postgraduate programme in ICT education, and both teachers adopted a collaborative pedagogical approach in facilitating learning and ongoing formative assessment processes. However, the course content in Case 1 (Course 1) was unstructured (more open-ended) as compared to Case 2 (Course 2). The teacher in Case 1 designed the key learning activities including the embedded assessment activities, while the specific learning resources and formative processes were shaped by both the teacher and student alike as they interactively collaborated to develop the course content and create learning opportunities. Although the course goals were clear to the teacher in Case 1, the specific teaching and learning processes were not obviously anticipatable. As a result, the formative assessment processes including ongoing monitoring, assessment of evidence of learning and provision of formative feedback in case 1 were more multifaceted as compared to Case 2. For example, the unstructured nature of the course content is one of the factors that influenced the teacher of Course 1 to incorporate ongoing reflective writing alongside the other ongoing assessment activities and formative processes. Students in this course were expected and encouraged to progressively record their reflections within their individual online reflective journals which were open to both teacher and peers. Similar to Case 1, the teacher in Case 2 designed for collaborations within discussion forums to support the students to make their thinking visible to others and in turn foster interactive and reflective learning. Sustained interactions and reflective processes increased opportunities for ongoing self reflections (internal feedback) and external formative feedback from both the teacher and peers. The resulting synergy between self and peer feedback fostered deep understandings of the course content and expected outcomes that supported development of transferable competencies for these professional learners.

Both case studies illustrate that online formative assessment could be more productive in regard to promoting meaningful learning when the teacher and students alike play an active role in learning and formative assessment processes. Integration of ongoing formative assessment in both case studies and its interweave with summative assessment promoted meaningful learning and ongoing assessment of both processes and products of learning. The findings revealed that active learners' involvement in formative assessment processes of

ongoing monitoring, assessment of learning and formative feedback sustained productive engagement in these online courses. Collaborative engagement in learning and formative assessment processes nurtured self-regulated dispositions and development of a supportive learning community in which students were stimulated as a valuable source of formative feedback for themselves and their peers.

The findings of this research further illustrate that the nature of assessment activities is key to effective formative assessment. Provision of a variety of authentic assessment activities in both case studies fostered meaningful learning processes that supported students to apply and connect their learning to their existing knowledge and professional experiences. Moreover, these authentic activities were coupled with learner autonomy and opportunities for shared understanding of learning goals and expected outcomes, which stimulated these professional learners to engage with activities that fitted their own learning goals, needs and interests. These opportunities also created an authentic learning environment through prompting interactive collaborations among the individual learner, peers and the teacher within the constraints imposed by ongoing authentic assessment activities. The findings show that the students valued and benefited from the authentic learning and assessment activities coupled with opportunities for collaborative ongoing monitoring, assessment of evidence of learning, and interactive formative feedback. In describing their experiences in these two courses, both the students and the teachers alike acknowledged that these formative assessment processes promoted meaningful learning. This confirms that online learning could be more productive when pedagogical design is both learner and assessment centred.

Learner autonomy and opportunities to apply existing knowledge and experiences were also revealed as key elements of that fostered self-regulation and contextualized learning among professional learners in this study. While a few students experienced some challenges initially in engaging with open-ended authentic activities and participating actively within asynchronous collaborative discourse, they were increasingly able to self regulate and devise better learning strategies alongside being supported by the teacher and peers. This in turn assisted learners to achieve their learning goals and the expected outcomes.

As discussed in Chapter 7, it became apparent that the current findings reinforce previous research. The current study also went further to adopt a more holistic approach to systematically investigate online classroom settings and explicate multiple techniques of formative assessment as part of embedded assessment. A number of new strategies and techniques of formative assessment were also identified as illustrated through Chapters 4 and 5, and further elucidated in Chapter 6 and 7. It became evident that these techniques

facilitated productive synergies between: formative and summative assessment; self and peer assessment; and formative processes and development of interactive learning community in each course. These synergies had positive effects particularly in relation to promoting interactive collaborative and reflective discourse, and enhancing the quality of formative feedback in relation to its immediacy, adequacy and interactivity. These in turn resulted in a meaningful engagement that promoted self-regulation and deep learning.

Another important contribution from the current study is development of a theoretical framework to elucidate how effective online formative assessment can enhance opportunities for ongoing formative feedback within the ZPD to learning scaffold meaningful learning. In particular, application of a theory framework that entailed convergence of two theories (theory of situated cognition and Vygotsky's (1978) ZPD) was useful to draw out theoretical generalizations of the research findings. Within this theoretical framework, online formative assessment is manifested as process-oriented assessment of situated and authentic learning within the ZPD (this is detailed in Chapter 7).

8.3 Implications for practice

The findings of this study provide insights and illustrations that can inform practice with respect to embedding of assessment within teaching and learning processes. The findings of this study and their relationship with previous research have various implications for practice particularly within the context of online higher and professional education.

1) Application of formative assessment calls for embedded assessment that is underpinned on relevant theoretical perspectives. In exemplifying online formative assessment as an innovative pedagogical strategy, this study illustrates key elements that characterize appropriate practices with respect to application of formative assessment in online courses. Educators, particularly online courses who design their own courses, can enhance their practice in relation to embedding assessment in online settings through paying attention to the identified lessons learned and the key characteristics for effective formative assessment as discussed in Chapter 6. The identified key characteristics were further explicated through the development of a theoretical framework for embedded assessment in online learning (as reported in Chapter 7). It is important for online educators to consider underpinning their classroom assessment practices on elements of the theoretical framework advanced in this study. That is, the articulated theoretical framework can inform educators in ways that may support them to make better founded and consistent decisions on how to incorporate embedded assessment in their course design to support their online learners to engage more

meaningfully. Where possible with respect to their institutional policies, educators can apply this theoretical framework as a guide on how to incorporate authentic assessment that builds throughout the course duration for both formative and summative purposes.

2) *Maximizing productivity of formative assessment in online settings requires utilization of variety of strategies and techniques.* Formative assessment was manifested in the current study as part of embedded assessment in which various strategies were applied in both courses, such as: provision of a variety of authentic assessment activities; overlap between formative and summative assessment; self, peer and teacher engagement with formative assessment processes; and development of interactive learning community. These strategies were operationalized through a variety of techniques including analytical rubrics, topical and open asynchronous discussion forums, ongoing documentation and sharing of evidence of learning, and opportunities for ongoing interactions, monitoring and formative feedback. The use of many techniques for formative assessment in both courses was well supported by affordances of online settings. As discussed earlier in Section 6.4.4, utilization of the LMS features enabled opportunities for ongoing documentation and publicity of evidence of learning that enhanced opportunities for active learners' involvement in ongoing monitoring, assessment and formative feedback processes. This in turn increased quality of formative feedback in terms of its immediacy, interactivity and adequacy. These findings illustrate that educators and/or course designers can creatively utilize affordances of web-based ICT tools such as LMS to enhance formative feedback processes.

3) *Productive application of online formative assessment requires active involvement of individual learners, and collaborations with teacher and peers.* This multi-case study illustrate that both teachers applied formative assessment as a collaborative pedagogical strategy centred on 'interactions-on-authentic activity'. The teachers integrated formative assessment from the perspective of *designing for shared authenticity* in which learning resources and opportunities were shaped by learning experiences as students engaged in learning and assessment processes. In effect, the authentic formative assessment coupled with learners' autonomy, and opportunities for shared meanings and responsibilities were central to shaping learning experiences. The findings illustrated that authenticity cannot be predetermined but emerges from shared competence and ownership among the learners and teachers as a learning community. Shared authenticity in this study was emergent through interactions among the three defining components (individual learner, assessment activities and community) within which meanings were negotiated and reconstructed. This implies that online educators can foster collaborations within formative assessment processes to facilitate

shared authenticity, which promotes negotiated meanings and stimulates students to take ownership of their learning.

Cultivating and sustaining commitment among students as key actors within formative processes requires the teacher to design for the development of an interactive learning community with shared purpose and power. The findings showed that achieving productive shared power and responsibility necessitates teacher's vigilance and open-mindedness in order to effectively facilitate and ensure the efficacy within the shared formative processes. The teacher may also prompt collaboration among students by organizing them into various groups, and this could be of particular relevance in online courses with relative large numbers of students. In this study, both teachers flexibly organized students in groups of about three or four students (which were also open to all course participants) in reviewing and providing formative feedback on peers' artefacts. Previous research by Sorensen and Takle (2005), and Russell et al. (2006) also identified that effective group work dynamics can encourage students to assume primary responsibility for their learning and assessment while the teacher provides the necessary guidance as an expert facilitator.

The current findings further illustrate that shared responsibility and ownership within learning and assessment processes was enhanced by the ongoing interweave between formative and summative assessment. The interweave between formative and summative assessment was a key characteristic that promoted collaborations within learning and assessment processes. This particularly prompted learners to monitor and assess their own progress and that of peers, as well as actively collaborate within formative feedback processes. Through these, formative assessment enhanced students' motivation to learn and supported them to enhance their overall achievement in summative assessment, thus blurring the gap between formative and summative assessment. Moreover, opportunities for ongoing formative feedback supported the students to develop robust knowledge and skills that were transferable to their own professional practices and contexts. This implies that it is important for educators, where possible based on their institution policies, to design for ongoing assessment that is an integral part of teaching and learning.

4) *Enabling opportunities for sustained interactions and dialogue are key to increasing quality and uptake of formative feedback.* The evident synergy that resulted through utilization of variety of strategies and techniques for formative assessment imply that educators can utilize such a holistic approach to support meaningful learning and ongoing assessment. This in turn, may enable formative feedback in online settings to become richer as compared to face-to-face settings. For instance, the current findings illustrated that

opportunities for dialogic formative feedback that can be enhanced by use of various strategies and techniques. This in turn can provide learners with opportunities to take an active role in constructing their own meaning from the feedback that they receive and purposefully use it to improve their achievements.

The nature of the interactivity within formative feedback processes is illustrated within the findings of both case studies using network diagrams (see Figure 4.6 and 5.4). Conceptualizing feedback as constructive dialogue implies that feedback by itself may not necessarily prompt learners to revise their learning strategies. This implies that the meanings that students infer or construct from the feedback that determine to what extent they accepted, modify or reject it. This draws attention to educators to foster adequate opportunities for dialogue in order to reinforce the meaning of feedback in relation to how it is understood by the students, thus increasing possibility for its uptake. The eventual uptake of feedback by the intended receiver has been identified as key characteristic that indicates the effectiveness of formative feedback (Wolsey, 2008). Reinforcing the findings of the current study, Gaytan and McEwen (2007) also identified that interactive formative feedback processes can be operationalized through systematic utilization of a variety of online tools such as online discussions, group interactions, emails and online chats. This is likely to be useful to enable educators to overcome the limited opportunities for informal observations and questioning that are typically not readily available online as compared to face-to-face settings (Oosterhof et al., 2008); which became much richer than face-to-face classes in this study due to the online nature of the courses that was open to students with Internet access at all times thus stimulating sustained interactions with teacher and peers.

5) Effective application formative assessment relates to beliefs of the teacher and so must be compatible resulting in pedagogical approaches in which assessment is perceived as both formatively and summatively worthwhile. The beliefs and dispositions on assessment of educators, particularly teachers and course designers, is an influential factor in conceptualization of assessment as a means of promoting learning. The findings of this study illustrate that teachers' pedagogical beliefs can influence their approach to teaching, learning and assessment. The pedagogical beliefs of both teachers influenced the approach they adopted in designing their respective course which included embedding assessment that supported students to actively engage with others (particularly the teacher and peers). Young and Kim (2010) also argued that teachers' beliefs greatly influence their conceptions about what is valued as learning and, by implication how learning is assessed for both formative and summative purposes. Although Young and Kim addressed higher education contexts in

general without a specific focus on online settings, their viewpoints conform to the current research. This is particularly in suggesting that the teacher's pedagogical philosophy needs to become oriented towards perceiving assessment as both formatively and summatively useful, and not mutually exclusive. This implies that educators need to be self aware that the underlying pedagogical philosophy is a key influence on their pedagogical approach including assessment; and the extent to which they explicitly align assessment activities with the expected learning outcomes. It is also important for educators to recognize that their beliefs can greatly influence their intentional uses of assessment formatively and the extent to which this becomes a central part of their pedagogical practice. Teachers' beliefs will also determine the extent to which they foster shared understandings among students that formative assessment should reveal both what student know and what they don't know with the aim to discern and improve learning. Self awareness of these aspects could be useful in enabling educators to reflect their assessment practices; and in turn this may prompt them to capitalize on opportunities for ongoing formative assessment and seek for necessary institutional support where possible. This concurs with Baran et al.'s (2011) argument that:

It through critical reflection that teachers can be empowered as autonomous and self-directed professionals who constantly engage in dialogue about solving problems, making decisions, reflecting in action and collaborating with other key actors... Teachers must reflect on their roles as they become aware and critical of their assumptions toward online learning and teaching (p. 431).

6) *Application of ongoing formative assessment also calls for alignment among teaching, learning and assessment.* This study revealed the importance of reconceptualising assessment as an integral part of teaching and learning for purposes of promoting learning. The findings suggest that aligning assessment with teaching and learning processes can be achieved through ongoing formative assessment. This assertion also coincides with the recent recommendations to apply alternative assessment approaches and techniques (Webb & Gibson, 2011) who recommend application of alternative assessment approaches and techniques as a means to blur the gap between the formative and summative assessment, and in turn align teaching, learning and assessment. Although focused on the schooling sector the international recommendations through these authors are likely to also apply to higher education. This is consistent with the findings of both case studies in the current research. Indicating that embedded assessment in online learning has the potential to appropriately align teaching, learning and assessment, and blur the gap between formative and summative assessment. This implies that realization of appropriate alignment between formative and summative assessment necessitates innovative course design in which educators endeavour to

link formative and summative assessment in way that support meaningful learning. It is through such a focus that embedded assessment can serve the purposeful goal of promoting learning and making assessment more effective.

It also appears that realization of desirable alignment will depend on whether the knowledge and competencies achieved, as measured by summative assessment, align well with the way in which learning and formative assessment occur in the classroom. This implies that, for formative assessment to have a substantial impact on learning outcomes, it is important for educators (where possible with support of institutional policies) to ensure that the learning activities including the formative assessment activities and processes are in harmony with what is measured for summative assessment purposes. Based on inferences drawn from the literature, achieving desirable alignment may not be obvious in contexts where summative assessment dominates and formative assessment is not emphasized or considered when determining how learning is assessed (Palloff & Pratt, 2009). This implies that policy makers also have a role to play in enabling achievement of desirable alignment among teaching, learning and assessment and by implication supporting productive application of formative assessment.

7) Realization of effective pedagogical practices for embedded assessment draws attention to institutional policy makers to focus on educators' beliefs as part of professional development initiatives. Looking ahead towards how widespread implementation of formative assessment in online higher education may be promoted, there appears to be a need to repurpose professional development initiatives for faculty staff, including teachers, course designers, programme leaders, and those involved in quality assurance. Both teachers in this study had demonstrated professional leadership with support of relevant institutional policies in regard to applying good pedagogical practices for embedded assessment. The teacher of Course 1 had been the programme leader who had set up the postgraduate programme of CPD and managed its quality assurance as head of department. As already illustrated, effective assessment practices particularly in regard to application of formative assessment was influenced by teachers' pedagogical competence, leadership dispositions, and beliefs. It is therefore rational to infer that promoting meaningful online learning also calls for enhanced professional development for online educators in ways that go beyond focusing on specific pedagogical practices to develop relevant beliefs about teaching, learning and assessment.

Young and Kim (2010) suggested that pedagogical beliefs and dispositions play an instrumental role in regard to how educators may apply what they acquire from professional development initiatives. Young and Kim noted that "teachers' educational philosophies

influence how they react to instructional reform efforts...the teachers' beliefs acted as the filter through which new ideas were perceived, interpreted, and executed" (Young & Kim, 2010, p. 13). Previous empirical research also indicates that teachers' beliefs can influence how they benefit from professional development initiatives (Borko, Mayfield, Marion, Flexer, & Cumbo, 1997). Although Borko et al.'s study was within the face-to-face contexts, their findings are relevant in the contexts of online CPD. Their findings indicated that teachers tended to ignore new ideas and practices that were incompatible with their own philosophies. Borko et al. concluded that, "if they were to embark on another staff development effort, we would build in explicit attention to beliefs as well as practices" (Borko et al., 1997, p. 274). In the context of online assessment practices, this implies that it is important for professional development initiative (at institutional or national level) to focus on how to support educators to best apply formative assessment within online contexts, while also paying attention on how to support educators to change their beliefs and perceptions in regard to how this may influence their interpretations of the new ideas that they acquire from professional development initiatives. That way, professional development initiatives might become more productive with respect to supporting educators to underpin their practice on sound pedagogical philosophies as opposed to pursuit of the burgeoning educational technologies without considerations of congruent philosophical foundations. Such an approach in turn may enable educators within blended and online settings to support their learners to engage meaningfully and develop more competencies that are transferable to real-life professional contexts.

8.4 Conclusions

Conclusions are now drawn from the findings in regard to applying formative assessment in online courses to promote meaningful learning experiences.

The findings of both case studies illustrate that application of online formative assessment is more productive when responsibilities are shared among the teacher, peers and the individual learner. It became evident that application of formative assessment framed within shared responsibility can increase learners' engagement with the following experiences: active, contextual, interactive, collaborative, multidimensional perspectives, reflective and self-regulated learning. These experiences supported meaningful learning that was transferable to real-life context within the context of ICT-related professional development in continuing teacher education.

Provision of authentic learning in assessment activities accompanied by learner autonomy in both courses enriched the opportunities for sustained ‘interactions-on-authentic activity’. This increasingly fostered collaborative and reflective online discourse in which both the teacher and the students alike were prompted as key actors in meaningful asynchronous dialogue and provision of ongoing formative feedback. This finding reinforces previous research in showing that engaging learners with open-ended authentic activities can foster meaningful engagement (Mackey, 2009, 2011; Mackey & Evans, 2011). The current study goes further to provide rich evidence that adequate opportunities for negotiated meanings of learning goals and expected outcomes can foster shared authenticity, and stimulated dispositions of self-regulated learning. The findings illustrate that opportunities for interactive dialogue and ongoing formative processes within an authentic learning environment stimulated students’ ability to take ownership, and become responsible for their own learning and assessment both individually and as a learning community.

This study illustrates that incorporating embedded assessment for both formative and summative purposes can foster learner and assessment centeredness through promoting meaningful interactions, increased collaboration, and productive engagement with self and peer formative assessment. This research has provided rich evidence that online learning environments support the design of ongoing assessment to promote learning through its potential to support collaborative learning, and through facilitating interactive formative feedback. Such opportunities inevitably foster development of an interactive and supportive learning community in which both the learners and teachers became a key resource for supporting and scaffolding learning.

Both case studies illustrate that peer formative assessment processes can trigger self assessment and support students to enhance their learning and achievements. The synergy between self and peer formative assessment was notable from the formative assessment processes in this study. This greatly fostered reflective learning and stimulated students to purposefully monitor and formatively assess their own and peers’ learning. For example, the use of open online reflective journals provided students with opportunities to interact with both the teacher and peers within individual reflective processes. The findings from both case studies indicated that such opportunities prompted dialogic formative feedback and meaning making which manifests a constructive link between internal feedback (self-reflections and self-assessment) and external feedback in way that increased productivity of peer formative feedback.

The enriched quality of peer formative feedback manifests the effectiveness of online formative assessment in both courses. Distinctive aspects of quality and effectiveness emerging from the peer-peer formative feedback processes were the immediacy, inherent interactivity and mutuality, and how the students recognized themselves and valued their peers as source of formative feedback. These aspects also manifest increased possibilities of uptake of peer feedback. Both case studies illustrate that innovative application of formative assessment in online settings (as compared to face-to-face settings) can provide enriched opportunities for high quality formative feedback. For instance, such opportunities were enabled through the purposeful ongoing documentation and sharing of student-created artefacts in both courses. As discussed within Section 6.4.2, it was evident that such opportunities enhanced the quality of peer-peer formative feedback in ways that promoted meaningful interactivity, reflective thinking and self-regulatory strategies among the students.

Both case studies revealed an overlap and synergy among the core strategies of online formative assessment (self, peer and teacher). This in turn nurtured the development of a robust and supportive learning community as an emergent strategy. The emergent online learning community in both cases fostered interactive and collaborative learning. The findings further showed that the sense of learning within a supportive online community bound by common goals and practice (as continuing professionals) created an authentic learning environment through stimulating students to apply their prior knowledge and experiences. Recognition of students' previous knowledge and professional experiences by both teachers their respective course, and going beyond to design for sufficient opportunities to prompt students to apply these as a valuable learning resource fostered development of a robust and productive learning community in each course.

Overall, the current research emphasizes the importance of sustaining interactive collaborations within formative assessment processes to nurture development of robust and supportive online learning communities. The synergy between formative processes and emergence of an interactive learning community diminished the need for both teachers to predict the students' actions and/or questions in order to provide desirable formative feedback. This is because the students had increasingly developed the willingness to express their thinking and make it visible to others through publicly articulating their developing understandings and abilities. Moreover, the reciprocity between the formative assessment processes and the sense of learning within a supportive community pre-empted the need to predict the source of formative feedback as students increasingly became mutually responsible for each other's learning needs both cognitively and affectively. The students'

active role in their own learning and assessment also prompted them to apply their existing knowledge and make constructive connections to their lived experiences as continuing professionals. Inevitably, such opportunities supported learners in meaningful ways to become knowledge builders and develop new competencies. Moreover, sharing their perspectives and exposure to diverse experiences from their peers increased opportunities for critical formative feedback, and prompted them to think in new ways that promoted meaningful learning. The findings of this research illustrate that productivity of formative assessment in online settings could be enhanced by opportunities for shared discourse and artefacts among the learners. Indeed, it is in this way that formative assessment is likely to promote meaningful learning and ongoing assessment of course goals in ways that fittingly meet the goals and needs of professional online learners.

To this end, it is apparent that effective application of online formative assessment framed within situated and authentic learning perspectives can enhance meaningful learning and assessment. Both case studies manifested multifaceted interactions among the teacher and students that were prompted by the embedded authentic assessment activities. The variety of ongoing authentic activities and opportunities for interactions provided a structure for ongoing formative assessment (assessment within the ZPD) and summative assessment (assessment of ZPD). Therefore, it can be concluded that online formative assessment is a pedagogical strategy that can increase the quality of professional education.

Acknowledging that this study was conducted within a specific setting and that there is need for further research in other contexts, the following sections present limitations and delimitations as well as recommendations for further research.

8.4.1 Study limitations, delimitations and recommendations for future research

8.4.1.1 Study limitations and delimitations

This research was designed as multi-case study situated within a particular setting, and therefore the findings are not entirely transferable to other contexts. Among the notable particularities of the context of this study include: (a) the research setting was a specific online learning environment (Moodle Version 1.9 as the LMS) within a New Zealand university; (b) the two courses (both case studies) were within the same university programme, were entirely online and at postgraduate level with ICT in education as the subject domain; (c) the students were continuing professionals with previous academic qualifications and professional experiences; and (d) the courses (guided by the curriculum)

demonstrated leadership and autonomy in designing for embedded assessment for both formative and summative purposes.

These particularities of the research context notwithstanding, both conceptual and analytic generalizations are considered possible (Yin, 2009). The theoretical underpinnings underlying this study provide a basis to compare and generalize the research findings to broader theoretical perspectives. In particular, the developed theoretical framework as presented in Chapter 7 illustrates the generalizability of the current findings to theory. The possibilities for analytic generalization of the research findings imply that the findings may be flexibly adaptable to other contexts. The key findings in the current study including the identified lessons learned (see Section 6.4.3) and the key characteristics (see Section 6.4.4), and the elements explicated in the advanced theoretical framework are agreeably relevant in other higher education settings. These findings and the implications articulated in the preceding section may inform the readers about innovative application of formative assessment in online settings. These may particularly guide educators to make informed decisions and support them to achieve effective pedagogical designs for their courses within online and blended settings.

As previously noted, this research comprised two individual case studies within which the researcher participated in the role of a participant observer. As a delimitation, it is important to note that the researcher's active role in the research setting as participant observer was a minor one, including overtly observing the course participants and minimal active interactions with them. The minor role as a participant observer may be expected considering that the researcher was coming from an 'outside context' to become an insider within the confines of the institutional policies. Albeit in a minor active role as a participant observer, the researcher's experiences were not limited because the insider position from the outset of each course allowed the researcher 'to experience the participants and experience with them'.

Despite these limitations and delimitations, the multi-case study research design employed in this study provided an opportunity to conduct the research within the domain of practice (as opposed to a controlled environment). This allowed in-depth investigation of the phenomenon within the constraints of its real-world (naturalistic) contexts and with participants' 'voice' in consideration, thus enhancing the credibility of the research findings. In addition, the role of a participant observer served an essential purpose by allowing the researcher to be strategically positioned as an insider without being overly influenced by multiple roles and the possible subjectivity. Being an insider assisted the researcher to

enhance understanding of the participants' meanings from their viewpoints. This was useful in enhancing the accuracy of interpretation of the meanings presented from this research. This notwithstanding, the researcher acknowledged the possibility that these interpretations of meanings were also likely to be influenced by participants' knowledge and experiences including the researcher as a participant observer. Therefore, while taking advantage of case study methodology with a bias on interpretive perspectives, the researcher was also keen to minimise possible bias through applying various techniques to verify the evidence obtained and enhance validity of the findings (see Section 3.6.4.1 and 3.7). For instance, as a way of minimising bias, the researcher was keen to continually monitor own subjective perspectives by reflecting upon the notes recorded through her online observations and in some instances checking out with the courses. Another way of reducing possible subjectivity was by member checking with the participants to verify accuracy in attention to their voice through sharing the interview transcripts with the individual participants for review. Triangulation of data to corroborate the evidence from multiple sources was also useful in minimising possible bias.

Another important aspect that was considered as a key strength in this research was that both teachers' pedagogical approach closely aligned with the targeted pedagogical design. This was particularly with respect to the design of embedded assessment framed within authentic learning perspectives as the core of the phenomenon under investigation. Additionally, both teachers were passionate about the study topic as experienced online educators and researchers. These teachers were therefore willing to go beyond being ordinary research participants to supporting the researcher as key informants. Therefore, the purposeful selection of the teachers in this study gives rise to caution in applying the findings directly to teachers and other educators who are less knowledgeable and experienced, although the implications for professional development are less problematic.

8.4.1.2 Recommendations for future research

In order to confirm the current findings and contribute further understandings in this field, there is need for further research. Further studies could provide enriched understandings on how formative assessment can be productively applied in online settings. The design used in this study may offer an effective strategy to research on how to achieve innovative pedagogical designs in other settings that addresses the issues of validity and reliability of online formative assessment, identified as critical in this study.

It could also be interesting to apply such a systematic approach in researching courses for various subjects in education other than ICT, as well as other disciplines such as business

and sciences at both undergraduate and postgraduate levels. Typically, undergraduate courses are often characterized by students with no previous professional background and experience, as well as a larger number of students as compared to postgraduate level. Researching such contexts could be useful in expanding the current understandings in regard to the effective practices for online formative assessment in order to inform widespread application in higher education. Similarly, it could be useful to conduct comparative studies with such focuses in different countries. This may provide an opportunity to uncover the influences of different educational cultures, and probably teachers with differing pedagogical beliefs. Comparative studies on students enrolled in different courses with varying assessment approaches could also provide some further insights on the impact of embedded assessment for both formative and summative assessment.

Other relevant areas of further research include the selection and complementary use of online tools including LMS with features of self-assessment quiz and asynchronous discussion forum tools, and web-based electronic portfolio systems. Although the current study mainly exemplified creative use of asynchronous discussion forums (as an embedded tool within the LMS) for different purposes within learning and assessment processes, it would be timely and useful to illuminate other effective strategies and tools. It could be useful to enhance understandings about how use of emerging ICT tools can support meaningful interactions and other formative processes among online learners within various disciplines and specific subject areas. Such tools include the emerging mobile technologies like the iPad which enables mobile and interactive access to a full range of networked information and applications anywhere. Educational use of augmented reality (AR) is another set of innovative tools that could be interesting to research in regard to how this can promote online learning through its capability to support layering of information over 3D space that simulate enhanced reality of illustrative scenarios. It would also be useful to research how such tools would be used appropriately to fit learners within varying academic levels and courses, at both undergraduate and postgraduate levels.

Moreover, it is important to conduct further research to explore appropriate configurations for these tools in order to facilitate the desirable formative processes in varying educational contexts including different disciplines. For instance, to exemplify the effects of enabling certain capabilities of learners' experiences with these online tools within varying contexts, this is with respect to publicity or openness capabilities as demonstrated in this study. This would be useful in providing insights in relation to the extent to which sharing of learning and assessment processes and products, including publicity of students' work in

progress, can foster shared purpose and collaborations among course participants within formative processes. In addition, it would be worthwhile to conduct further research to better understand how learners' involvement and autonomy in configurations of these tools can foster shared purpose and responsibility among the teacher and learners. For instance, a study by Ng, White, and McKay (2009) illustrated how web-based e-portfolio systems can be appropriately standardized for ease of use without hindering learner creativity and autonomy. Ng et al.'s study was within the context of health sciences at both undergraduate level and as part of continuing professional development programme in which e-portfolios were used in ongoing assessment for both formative and summative assessment purposes. Their findings showed that learner autonomy in regard to customization and/or flexibility of settings and features within the web-based e-portfolio system was critical element in promoting reflectivity and self-regulation.

Moreover, it would also be interesting to conduct similar studies in this field at both the course level and programme or institutional level. While embedded assessment for both formative and summative assessment did not emerge as a critical issue in the current research setting, conducting further research at both course and programme/institutional level could illuminate whether the goals and purposes of embedding assessment in a course can conflict programme or institution goals or expectations, and to what extent this may affect the effectiveness of embedded assessment, and formative assessment in particular. This is interesting because, various researchers (Hassall, 2007; Strudler & Wetzel, 2008) have shown that the goals and purposes of a course and a programme/institution can conflict and reduce the effectiveness of innovative pedagogical strategies.

8.5 Concluding thoughts

This study entailed an in-depth investigation into application of online formative assessment in two online courses within the context of ICT-related professional development for continuing teachers in a NZ university. Conducting this research within the selected courses provided the researcher with a suitable setting to explore the design of formative assessment in online courses, and elucidate how this can support continuing teachers to develop relevant professional competencies in ICT. The qualitative case study design allowed the researcher to richly illustrate the design of ongoing authentic activities and formative assessment processes that could be utilized to enable online learning to move beyond expanding access to higher education to increase the quality of CPD for teachers. A key finding from this research is to emphasize the active role of the teacher and students alike to facilitate the identified multiple

techniques; and foster shared ownership and responsibility. Indeed, it is in this way that formative assessment is likely to promote meaningful learning and ongoing assessment of course goals in ways that also meet the goals and needs of professional online learners. The positive findings from this study also suggest the relevance of online formative assessment in other fields, in addition to that of education. The insights drawn from this research are particularly instrumental to the researcher with her interests to contribute towards promoting use of ICT in way that increase the quality of online higher education as it gains momentum in developing countries.

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Gikandi, J. W., Morrow, D., & Davis, N. E. (2011). Online formative assessment in higher education: A review of the literature. *Computers & Education*, 57(4), 2333-2351.

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Appendices

Appendix 1: Literature review methodological procedure

Appendix 1.A: A sample of two of the reviewed studies to illustrate criteria applied in analyzing the literature

Author	Year	Mode of study	Discipline /Subject	Purpose/ central focus
Pachler et al.	2010	Blended	Multidisciplinary: Teacher education, Social sciences, Veterinary training	To explore how the current theoretical perspectives and pedagogical practices relate to formative e-assessment : Aspects of practice that constitute formative e-assessment
<p>Methodology: Design-pattern based methodology; qualitative approach; involved various practitioners' from 16 different education contexts within UK. Contexts included work based learning, distance education, further education, post graduate and different undergraduate and postgraduate university programmes.</p> <p>Theoretical framework: Moments of contingency (intervention) and Laurillard's conversational framework as a view of learning</p> <p>Strengths: Research framed within a theoretical framework; included different context thus enhancing generalizability</p> <p>Weaknesses: Limited methods of data collection (practical inquiry days and interviews); data only reflects teachers' point of view who presents their observations; experiences and perceptions as narratives; student learning experiences and outcomes, and perceptions are not presented; does not address the differences arising from the variety of contexts.</p>				
<p>Summary of major findings</p> <ul style="list-style-type: none"> • Teachers, individual learners and peers are key components in formative assessments and need to be actively engaged with learning processes • Integrating formative e-assessment into teaching and learning itself does not lead to effective formative assessment, rather, effectiveness is determined by learners and teacher actions and responses • However, the nature of technological resources may influence effectiveness of formative assessments depending on how the tools are designed and actually used • Aspects such as opportunities for monitoring learner progress, formatively useful and timely feedback, meaningful (e.g. case-based) activities, reflective practice, shared responsibility, dispositions towards self directed learning, self scaffolding interventions (non pre-specified sequence of instruction), mentoring and clarity of learning goals which are key opportunities of formative assessment that can be enhanced by technological resources, hence formative e-assessment can afford these opportunities 				
Gaytan and McEwen	2007	Online	Multi-disciplinary: Teacher, Business, Technology, Arts and Science	To enhance understanding of effective instructional and assessment strategies in online learning environment

Author	Year	Mode of study	Discipline /Subject	Purpose/ central focus
education				
<p>Methodological approach: Survey design</p> <p>Strengths: Large numbers of participants were studied (participants included 85 faculty and 1,963 students in online courses at two Universities. Both teacher and students' experiences and views are presented</p> <p>Weaknesses: No theoretical framework presented but some perspectives of authentic learning are emerging; did not employ interviews as a data collection tool. This is a key tool in descriptive research method, which could have helped to dig deeper understanding of data obtained from survey.</p>				
<p>Summary of major findings</p> <ul style="list-style-type: none"> • Formatively useful, immediate and continuous feedback is a critical component of formative assessment in online learning that helps to enhance student understanding of learning goals and content • Monitoring and assessing student progress need to be enabled to allow determination and provision of meaningful feedback • Assessment activities need to be well planned and explicitly explained to enable the learners to easily understand what is required of them; "Assessments must be carefully and systematically planned to require students to demonstrate that learning has occurred by completing a specific piece of work at various stages in the course and be given meaningful feedback" (p. 126) • There is need to use a variety of assessment tasks and/or techniques, "effective assessment techniques, as perceived by faculty and student respondents include projects, portfolios, self-assessments, peer evaluations, weekly assignments with immediate feedback, timed tests and quizzes, and asynchronous type of communication using the discussion board" (p. 127) • Frequent, dynamic and meaningful interactions among online participants (teacher and learners) are essential in promoting active participation, strong learning community, collaborative learning, which are key aspects of formative assessment. "The value of e-mail messages, chat room conversations, and discussion board postings should not be ignored as they provide opportunities for the instructor to learn whether the students understand the instruction and are correctly interpreting the assessments" (p. 129) • There is need to have shared understanding of expected processes and outcomes by providing very clear rubrics • There is need to provide room for gathering student perceptions about what and how they are learning 				

Appendix 2: Samples of the research instruments

Appendix 2.A Interview guides

2.A.1 Teachers' initial interview guide (at the start of the course)

1. Tell me your ideas and beliefs about formative assessment? In other words, what do you value about formative assessment?
2. Please describe the formative aspects or strategies you plan to adopt in this class
3. Please tell me about how you are integrating these aspects in the course?
4. In what ways do you think the formative aspects are likely to enhance students learning experiences?
5. Do you foresee any challenges that you might experience in the process of applying these formative aspects?
6. Is there anything else you would like to say?

2.A.2 Student interview guide (at the end of the course)

2.A.2.1..Interview guide with students in Case 1

1. Tell me how you feel about learning online?
2. Please tell me how the online discussion forums supported your learning? Did peers' views/responses enhance your understanding of content? Did they help you to see things from multiple points of view? What would you say about the diversity and depth of peers' views? Do you have some examples you would like to give? In what ways did you find it helpful to your learning by being able to refer to the previous contributions and/or responses (posted by you or other course participants)?
3. In what ways did the facilitation of the discussion forum support your learning?
4. What aspects stimulated you to participate in the online discussions? Did the course community (peers and the teacher) influence your participation in the class forums in any way? How?
5. Tell me more about how relevant the assessment activities were to your work context? To what extent were you able to apply your previous knowledge and experiences while accomplishing these activities? Did the activities prompt/allow any interactions with real world context or your work context in any way? Did they prompt you to reflect about your own practice? (e.g. the preliminary investigation assignment) In what ways did you find it helpful to have the autonomy or flexibility to choose your own project/topic? Do you plan to implement/apply what you learned while undertaking the assessment activities? In what ways do you expect it to impact on your practice? Please give some examples. Did you experience any challenges along the course of doing these activities? Which ones?
6. Did the assessment activities relate to or support your personal learning goals and interests? Did they stimulate you to explore beyond the assessment requirements and explore new tools/aspects? Do you have some examples would like to give?

7. Please tell me more about the assessment rubrics in relation to their clarity and adequacy - How they helped you to understand the assessment requirements? How did they help to monitor and reflect on your progress and achievements?
8. In what ways did you find the forums for asking questions, discussing rubrics and issues related to assignment activities helpful (e.g. in A3)?
9. How did you find the exemplars (e.g. examples as part of the learning resources, teacher illustrations or even examples from fellow students) provided within the course helpful when undertaking the assessment activities?
10. Please tell me more about how helpful you found the teacher feedback while undertaking the assessment tasks
11. In what ways did you interact with fellow classmates while undertaking the assessment? Was this helpful? Any examples?
12. Did the assessment activities stimulate you to interact with your fellow classmates outside UC Learn (e.g. through email, face-to-face informal chats/meetings)? How did this support you to accomplish the tasks?
13. Did you interact with other people (e.g. colleagues or other practitioners) while undertaking the assessment activities? In what ways?
14. In what ways did the writing of the professional enquiry in the shared WIKI support your learning?
15. Did you find reflective writing (in your reflective journal) useful to your learning? In what ways?
16. Did you find sharing of your work (by being visible to everyone within the course) helpful to your learning (e.g. reflective journals, preliminary enquiry in the WIKI, within the online class)? Did this prompt you to reflect about your progress? Did you find it useful to share A4 presentations? Did you find it helpful to receive (and give) peer feedback about your A4 presentation? In what ways?
17. Did the assessment activities stimulate you to utilize the resources provided? Did you look for additional resources? In what ways did you find this useful to your learning?
18. Did the variety of ongoing assessment activities support your learning in this course? Did this help you to reflect about your learning? Did this help you to enhance your achievements/performance? How would you compare this with the assessment approaches which you might have experienced in other courses/programmes?
19. Any other comment you would like to give?

2.A.3 Teachers' interview guide (at the end of the course)

2.A.3.1 Teacher interview guide with Teacher A in case 1

1. To what extent did the students participate actively as expected within the learning discussion forums? (in relation to the specific learning goals for this activity) Do you think they benefited from this participation in relation to: Being able to engage deeply? To what extent were they able to relate/connect these discussions to their own practice/context or other practical issues/experiences? Do you think this helped them to explore or think of new possibilities or tools? What would you say about some students commenting they found some of their peers to be providing more useful feedback while the social presence of others was less felt? There was also some instance of some students feeling overwhelmed by what they referred to as huge posting from their peers, do you

have any comments about this? Do you think these issues may have influenced participation within the forums?

2. In what ways do you think the students (and the class in general) benefited from facilitating the discussion forums? Did this meet your expectations in relation to the learning goals? How did involving the students in determining the facilitation schedule help; for instance, by starting with the more confident student do you think this helped to model for those who felt less experienced/confident? Why was there one instance of a group of two? Did you think this helped?
3. To what extent do you think writing professional enquiry in the collaborative WIKI supported students learning? Were they able to engage deeply as expected?
4. What would you say about a few students appearing uneasy as they attempted to adapt to asynchronous modes of interactions and overcome influences of their learning styles? Do you think such influences may have affected participation of such students in the online space?
5. To what extent do you think students were able to engage meaningfully with relevant and authentic topics/issues during the projects (A3 investigation)? Did this stimulate them to interact with their work contexts/ other real-life contexts? To what extent were they able to demonstrate the aspects of reflectivity/reflective praxis? Do you think this helped them to explore or think about new ways or tools? Did they experience any form of challenges? To what extent did they meet the expected requirements?
6. Tell me more about how you think the students utilized the open forums for discussing assessment topics/ideas or asking assessment related questions? To what extent do you think this enhanced their understanding of assessment requirements? Did you find this open space beneficial as opposed to having students ask questions privately e.g. through email? To what extent did the students choose to seek help or ask questions privately?
7. How useful did you find it to gather feedback from students in relation to helping you to support their learning? Which other opportunities did you have to identify students' needs in order to give them tailored support/feedback?
8. To what extent do you think the student engaged meaningfully in reflective processes and activities (e.g. writing reflective journals)? Do you think this supported them as they accomplished the assessment tasks? How was this helpful to you as a teacher e.g. in relation to informing the feedback you gave to the students?
9. In what ways do you think the students benefited through ongoing documentation and sharing their work (by being visible to others) within the UC Learn? Do you think this supported them as they accomplished assessment activities? Do you think this supported them to reflect on their own learning and progress? Did this support you as a teacher in ongoing monitoring and providing feedback? In what ways do you think providing peer feedback on peer's work benefited the learners? (e.g. A3/4 presentations)
10. In overall, to what extent do you believe your assessment approach in this course supported student learning? (by being ongoing, variety of activities and overlap between formative and summative assessment) What did you value most about this approach? Do you think these supported students to enhance their performance in summative assessment? Is there anything you would do differently if you were to teach this course in future, especially in relation to assessment? What and why?
11. Is there anything else you would like to say?

Appendix 3: Artefacts in Case 1 and analytical descriptions

Appendix 3.A: Analytical rubrics in Course 1

Appendix 3.A.1: Rubrics for A1: Participation

Rubric for Participation				
Assessment Dimension	Category	Criteria for a Pass	Credit Criteria	Points Awarded
<i>Communication</i>	Online discussions	Participation in at least 66% of the online discussions and participatory activities. Contributions are made within the expected time frame. The views of all participants are considered and valued.	Participation in most or all discussions. A timely response is given to others and a consistent effort is made to engage with others' ideas and experiences in ways which build community relations. The views of all participants are considered and valued. (Points possible – 2)	
<i>Critique and Debate</i>	Engagement with the concepts, ideas and debates	Comments should demonstrate engagement with the material.	Contributions demonstrate thoughtful critique of the material; insightful analysis of arguments; and/or the ability to synthesise, apply, create or defend ideas with rigor. (Points possible – 3)	
<i>Communication</i>	Seminar	A summary of one topic is presented for discussion. Key aspects of a chapter or reading are presented to others, along with a discussion starter.	The presentation is timely, engaging and informative. The content of the seminar presentation summarises key points in a critical or thoughtful manner. Guiding questions encourage others to reflect on the topic. (Possible points – 2)	
<i>Knowledge and skills</i>	Facilitation	The seminar discussion is facilitated throughout the week with regular responses, comments or questions.	Facilitation demonstrates engagement with the content and ideas of others; responses are thoughtful and invite further discussion. The seminar is clearly introduced and the conclusion draws together ideas and key points. (Possible points – 3)	
<i>Engagement in reflective praxis</i>	Online Journal	Regular entries are made in personal online journal (at least one entry for each section in the first semester).	Entries indicate critical thinking which relates theory to practice, and addresses 'so what' and 'now what' questions. (Possible points – 2)	
			Total possible points	/12

3.A.1: Self Assessment Rubric

Add your self assessment of additional credit points earned and a brief comment explaining why. (Remember that meeting the criteria with no additional points is still a pass.)

Assessment dimension	Criteria met ✓ or ✗	Possible points	Self assessment	Comment
<i>Communication</i>		4		
<i>Critique and Debate</i>		3		
<i>Knowledge and skills</i>		3		
<i>Engagement in reflective praxis</i>		2		

Appendix 3.A.2: Rubrics for A2

A2 Professional Enquiry Rubric				
Assessment Dimension	Category	Criteria for a Pass	Credit Criteria	Points Awarded
	Identification of topic	The focus of the enquiry is clearly identified.	NA	
<i>Analysis of Literature</i>	Identification of key authors	At least two or three key authors in the field are identified with a brief description of their contribution or type of work.	NA	
<i>Analysis of Literature</i>	Theoretical perspectives	At least one underpinning theoretical perspective is identified and described in relation to the identified topic or issue.	The discussion justifies and explains a theoretical perspective which shapes research in the field. The succinct explanation demonstrates insight regarding the implications of this theoretical perspective (perhaps through strengths, limitations, or connections between theory and practice). (possible credit points 2)	
<i>Analysis of Literature</i>	Conceptual models and frameworks	At least one conceptual model or framework is identified and described. Or, one particular approach to researching in this area is explained.	The discussion demonstrates a critical insight into the concepts, model or framework. The writing includes more than a basic description and illustrates understanding of the elements and their application to the study. (possible credit points 2)	

<i>Analysis of Literature</i>	Key debates or findings	At least two or three relevant points are described which show some understanding of current thinking on the topic.	The discussion demonstrates engagement with the findings and implications of the reviewed work. Ideas are fluently expressed and indicate critical understanding across the reviewed work. (possible credit points: 2)	
<i>Analysis of Literature</i>	Selected examples	Two appropriate examples included with at least one from peer reviewed journals. The citations, research question and setting are described.	The two examples come from well-regarded scholarly sources and are highly relevant and clearly focused on the topic or issue. (possible credit points: 1)	
<i>Analysis of Literature</i>	Selected examples - research findings	The main findings or conclusions are explained for each study.	Demonstrates sound understanding of the important aspects of the study including implications for future research and/or practice. (possible credit points: 2)	
<i>Critique and Debate</i> <i>Analysis of Literature</i>	Implications for Practice	The final section connects the reviewed research to the original issue or topic. Implications for practice or future research are identified. Some statements may be better developed than others.	Written in a convincing manner with points clearly linked to both the literature and the issue/topic. Demonstrates sound understanding of how the existing work can inform and guide practice and/or research. Limitations are noted where relevant. (possible credit points: 2)	
<i>Communication</i>	Mechanics	The wiki page/s follows guidelines for structure and content. Publications are referenced in correct APA formatting No errors or only one or two minor syntax, typographical or spelling errors that do not detract from the message. The word count for each section is adhered to.		
<i>Communication</i>	Writing	The writing is clear and competently constructed. Transition phrases (i.e. for example, in particular, furthermore, equally important, similarly, consequently, finally, in conclusion) are used to ensure understanding and ensure smooth transitions between sentences and paragraphs. The level of writing is consistent with that expected at Masters level.	Outstanding work that is valuable to others in education and/or training and presented professionally. (possible credit points: 1)	
			(total possible credit points: 12)	

Appendix 3.A.3. Rubrics for A3: Preliminary Investigation

		Options 1-8		
Assessment Dimension	Category	Criteria for a Pass	Credit Criteria	Points Awarded
Knowledge and skills; Research and development	Introduction	The introduction describes the purpose of the investigation in general terms and describes the setting or context.	The introduction describes the purpose of the investigation in a convincing and articulate manner with reference to appropriate theoretical and/or practical considerations as well as relevant contextual factors. 2 credit points	
Knowledge and skills; Research and development	Implementing the investigation	The investigative strategies are explained adequately and describe what was done, how it was done, and what happened.	The investigation is clearly explained and choice of strategies justified. Strategies align with the purpose and are well-chosen. 2 credit points	
Reflective practice	Ethical considerations	If applicable ethical considerations are noted and there is evidence that the investigation was conducted without compromising ethical standards.	NA	
Analysis of literature	Literature review – scope	The scope of the literature extends beyond material presented in A2.	There is evidence that the literature review draws on material from a variety of sources including high quality peer reviewed journals and other relevant sources. 1 credit point	
Analysis of literature	Literature review – structure and style	An attempt has been made to organize the literature around themes; and/or to synthesise, paraphrase and interpret the work of others.	The literature review is well structured with clear progression of ideas around coherent themes. Material is interpreted and synthesised in a sophisticated manner. 1 credit point	
Analysis of literature	Literature review - substance	The literature section synthesises important work, ideas and concepts to support the investigation.	The review demonstrates a level of critique and engagement with theories, concepts or frameworks. There is a coherency between the literature themes and the investigation as a whole. 1 credit points	
	Content – substance	Criteria will depend on the option followed, e.g., if Option 1 it will relate to the strength of the critique and argument presented in the literature; for a practical investigation the criteria will relate to the quality and extent of the activity undertaken.	Credit points will be awarded in relation to how well the investigation delivered on the purpose of the investigation. Credit points will be awarded for rigor, quality and internal consistency between the purpose, the activity and the reporting of that activity. 4 credit points	

Critique and debate	Discussion	Outcomes or findings are discussed. Some attempt is made to interpret the investigation in terms of theoretical perspectives, concepts or the work of others.	The discussion is insightful and critical showing how aspects of the investigation relate to existing research or theories. Includes clear links to literature. 2 credit points	
Reflective Praxis; Research and development	Implications	The investigation provides some direction in terms of future research.	Conclusions from the preliminary investigation have refined the research focus leading to a clearly articulated research problem and/or research question. 1 credit point	
Communication	Mechanics	Formatting is consistent with only minor flaws, and text is accurate with only minor typographical errors that do not detract from the message.	Work is error free and presented to a high standard. 1 credit point	
	Writing style	Writing is generally acceptable but uses simple structures with minor flaws.	Writing is well-structured, and linking between paragraphs/sections conveys cohesion and fluency. 1 credit point	
	Referencing	An effort has been made to reference all material in correct APA formatting	APA formatting is accurately and consistently applied. 1 credit point	
		Base points - 18	Total possible credit points	17
			Total points	/35

Appendix 3.A.4: Rubrics for assignment A4: Research proposal presentation

Assessment Dimension	Category	Criteria for a Pass	Credit Criteria	Points Awarded
Communication	Rationale	Presents a concise and informative summary of the investigation.	Content is concise, compelling and authoritative; provides justification for the research problem. 1 credit point	
Research and development	Research problem and questions	The research problem and potential questions are stated.	Appropriate research questions are formulated to enable the research problem to be addressed. 1 credit points	
	Suggested research design	A suggestion is provided about how the research problem might be investigated, with reference to a suitable methodology and/or research design.	The suggested methodology and/or research design is well suited to the research problem and questions, and shows evidence of being well-informed by literature (for example, references to similar studies). 1 credit point	
Research and development	Challenges and issues	Some consideration has been given to one or more of the following: <ul style="list-style-type: none"> • Practical challenges • Ethical issues • Limitations 	Brief points show understanding of ethical principles in relation to the proposed research 1 credit point	
Critique and debate	Feedback and critique	Timely feedback is provided to at least two other participants about their research presentations	Timely and constructive critique of at least two other presentations shows engagement with the ideas of others. 2 credit points	
Communication	Mechanics	Information is easy to access, navigate and understand. Minor formatting or technical flaws only.	Professional presentation framed appropriately for colleagues; well designed and error free. 1 credit point	
		Basic criteria - 8 points	Total credit possible points	/7
			Total points	/15

Appendix 3.B: Description of the relevant initial the mes emerging from the raw data

	Initial themes emerging from the coded data	Description
1	Recognition of the class as a learning community	Recognition of the class as a supportive learning community with common goals and interests of which members are reciprocal and supportive to each other. Also relate to teacher as a co-participant and a learner
2	Peer formative feedback as constructive responses from peers upon one's idea/work	Recognizing and reflecting about others' thinking or ideas, and learning experiences and deconstructing peers' experiences then reconstructing and sharing their viewpoint to agree and/or add varying dimensions. Identifying and connecting own ideas with others' shared thinking (like-minded or varying) and ideas in a way that builds to new ideas. In some cases, Reflective posting turning into a discussion: feedback within feedback and the receiver of feedback also becoming source of feedback
3	Sharing (or debriefing) of individual learning experiences within the online discourse and connecting how this is influencing their progress in accomplishment of the assessment tasks	Students being able to assess and debrief about their own learning experiences. Sharing of their own learning experiences within the course as sense of being members of the same learning community with common goals thus informing/prompting feedback/ inviting learning support from other members of the learning community and encouragement peers and reducing the sense of frustration and isolation, enhancing confidence of others who might be experiencing similar situations
4	Awareness and articulating about developing ideas, understanding and abilities	Awareness and reflections about developing ideas, understanding and abilities. Articulating and sharing own understanding of content and sometimes articulating how this connects or supports them to accomplishment of assessment tasks
5	Students sharing their developing ideas and progress in regard to where they are in regard to accomplishment of the assessment tasks	Students sharing their developing ideas in relation to their choice of assessment tasks and progress in regard to the accomplishing the assessment tasks
6	Connecting own thinking or ideas to the literature	Connecting ideas to the relevant literature (in relation to the course content). In this way students were able to engage with content and also improve their skill in scholarly/academic writing where they need to support or justify their comments and argument with existing theories, research and practices
7	Teacher formative feedback as informative responses to students question and/or teacher's feedback prompted by her monitoring the student's progress and achievement	Teacher formative feedback within the forums was prompted as response to individual postings by students to reinforce ideas and/or correct misunderstandings and/or as way of answering direct questions from students. The teacher feedback may include direct answer to clarify posed questions, constructive comments in response to learner's ideas to reinforce the learner's ideas, questions to prompt the learner think more critically/reflect. This may prompts the teacher to inject new resources. Some affective cues in some instances
8	Recognition of peers feedback or support	Recognition of others' (peers) feedback or support and connecting it with own ideas or reflecting about it to advance their ideas or think of new ways. In this way it becomes feedback on feedback - in turn prompting further comments from others thus extending the threading of feedback - interactive and reflective feedback. This may be feedback

	Initial themes emerging from the coded data	Description
		directly as a result of own shared thoughts/ideas and/or identifying (or getting interested in) with feedback that was prompted by another peer ideas and or questions
9	Connecting ideas to broader and relevant real-life contexts, issues and practices	Connecting ideas beyond own context to other relevant real-life contexts, issues and practices. Learners constantly recognizing themes as community of professionals
10	Teacher follow ups on student's progress and offering support outside the online classroom space	Teacher's follow ups on individual student progress and offering support outside the online classroom space
11	Connecting ideas to own professional context and practices	Connecting ideas to own professional contexts (own work colleagues and institutions) and practices. Awareness and recognition of how their developing knowledge and ideas on assessment tasks applies to their work context as professionals.
12	Affective gestures and casual social dialogue	Use of emotional gestures. Casual communication and tones among course participants sharing what is happening in their lives outside the online class
13	Reference to previous contributions by others or self	Course participants aware and able to connect to related previous postings archived in the online space
14	Recognition of teacher feedback	Recognizing the feedback from the teacher by articulating understanding of teacher feedback and how the feedback has been useful to their progress and sometimes going further to request for more feedback.
15	Self awareness and recognition of own strengths and weaknesses (learning style and learning needs as a online learner)	Self awareness/reflections - self awareness and recognition of own strengths, weaknesses (learning style and learning needs)
16	Stimulated to try or explore new possibilities or ICT tools - discovering new tools or how to use them as they engage within the discourse and interact with the class members	Stimulated to try/explore new ICT tools - discovering new tools as they interact with others within the discourse. This may relate to the aspect of multimodality -opportunities for varying approaches. Exploring ICT tools within a context
17	Direct question to the teacher or directing requesting teacher feedback or support	Direct question to the teacher that prompts feedback. For instance, this may be related to clarity of rubrics and guidelines, confirming whether one is on the right track in regard to achieving expected assessment outcomes.
18	Student feedback to the teacher updating her on their progress in regard to accomplishment of the assessment activities	Students' feedback (valuable information) to the teacher updating her on their progress in regard to accomplishment of the assessment activities. Indicating some element of self assessment

	Initial themes emerging from the coded data	Description
19	Awareness and setting own learning goals and strategies - self regulation	Assessment activities stimulating students to be able to self plan ahead for what and how they want to accomplish
20	Connecting across the curriculum	Connecting learning and the assessment activities across different subjects/courses within the discipline
21	Foregrounding or prompting awareness and articulation of individual previous understandings, skills, and experiences	Foregrounding or prompting awareness and articulation of own prior understandings (existing knowledge, experiences and/or perceptions) of key course themes and concepts. This relates to Sharing (making individual thinking visible) that prompts others (teacher and peers) to expand/inject new ideas/understanding of concepts, inject new resources – Expanding understanding of concepts by sharing with others which prompts them to add new dimensions and/or learn from our thinking
22	Directly prompting feedback from others (class members)	Recognizing and utilizing others as a source of learning support or feedback by directly prompting support from other course participants
23	Individuals sharing their personal experiences (learning or professional contexts and using metaphors)	Individuals sharing their personal experiences from other contexts (learning or professional contexts and using own metaphors to describe their experiences in other contexts and comparing this with their current experience in this course as they engage with the assessment activities.
24	Teacher fostering and encouraging students to achieve more meaningful (that can build into a bigger valuable whole) artefacts (assessment activities products and processes)	Teacher fostering and supporting students to achieve meaningful artefact (products and processes). And helping them to see connection among assessment tasks - how one assessment would inform or build into another assessment task
25	Seeing the building of a bigger picture from a variety of assessment activities - students able to connect how the assessment activities maps onto each other	Students seeing (awareness of) the building of a bigger picture from a variety of assessment activities. Students' awareness and applying ideas from one assessment to inform another assessment activity - identifying connections across variety of assessment activities
26	Teacher ongoing monitoring, encouragement and fostering of shared purpose of assessment activities	Teacher scaffolding, modelling and Fostering shared purpose and meaning of an activity through guidelines and/or illustrations/exemplars
27	Teacher recognition of exemplary ideas and work	Teacher recognition of exemplary students' work - outcome from assessment activities (artefacts)
28	Appreciation or compliments for feedback or	A comment that just compliment and/or just recognition or acknowledge the value of peers' work or ideas without giving any critical feedback

	Initial themes emerging from the coded data	Description
	support received from others	
29	Ongoing reviewing and flexibility of rubrics as need arises	Student autonomy in choosing their own assessment topics, direct questions or shared thinking prompting teacher reflection on the need to review of rubrics to fit multidimensional approaches
30	Valuing one's or others work on assessment task (artefacts) as something that can build into a bigger whole	Seeing the value of their work as something valuable that can be build to a bigger whole and meaningful beyond the classroom
31	Appreciation of analytical rubrics (clear and adequately detailed)	Students valuing the clarity and adequacy of rubrics in supporting them accomplish the assessment activities
32	Clarity for one's previous actions and or responses to avoid misconceptions or misunderstandings	Clarity for one's actions and or responses to avoid misconceptions or misunderstanding
33	Teacher recognition of peer-peer feedback	Teacher referencing and acknowledging the value of previous peer-peer ideas/feedback within her feedback

Appendix 4: Case 2 artefacts

Appendix 4.A: Analytical rubrics in Course 2

Appendix 4.A.1: Rubrics for Participation

Rubric for Participation				
Investigation of elearning tools and strategies/critique and debate				
Assessment Dimension	Category	Criteria for a Pass	Credit Criteria	Points Awarded
Communication	Online discussions	Participation in at least 66% of the online discussions Contributions to the discussions are given within the expected timeframe. The views of all participants are considered and valued.	Participation in most or all discussions. A timely response is given to others and a consistent effort is made to engage with others' ideas and experiences. The views of all participants are considered and valued (Points possible – 2)	
Knowledge and skills	Practical experience	Practical experiences are discussed. Some examples are shown.	Practical experiences are evident through discussion. Examples are consistently shown and the process of learning is evident in the discussion (Points possible – 2)	
Critique and Debate	Engagement with the content	Comments should demonstrate engagement with the material.	Comments are insightful, thoughtful and demonstrate a developing understanding of the use of ICT to support meaningful learning. (Points possible – 2)	

Appendix 4.A.2. Rubrics for Assg.1: Annotated bibliography

Rubric for bibliography				
Assessment Dimension	Category	Criteria for a Pass	Credit Criteria	Points Awarded
Analysis of Literature	Number and selection of articles	There are at least 10 articles that have been sourced from peer-reviewed research journals.	There are up to 15 articles from peer-reviewed research journals. The articles represent a good cross section of research and are focused on a selected topic. The articles have been chosen to cover different aspects of the topic. (possible credit points: 1)	
Critique and Debate Analysis of literature	Research findings	Research findings for the articles explain the conclusions from the study. Findings from some of the articles may be better developed than others.	The summary of the research findings for each article is clear, concise and demonstrates a good understanding of the important aspects of the study. (possible credit points:1)	
Critique and Debate Analysis of Literature	Implications for Practice	Implications for practice have been included for all research studies. Statements demonstrate an understanding of how the research findings could relate to educational practice. Some statements may be better developed than others.	The implications for practice for each article are clearly written, concise and demonstrate a strong understanding of how the research findings could relate to educational practice. (possible credit points: 1)	
Critique and debate Communication	Summary Statement	A summary statement of (approximately 300-500 words) draws together the research findings from all articles in the bibliography and shows how they are related to the topic. Correlations are made between the research studies.	The summary statement (approximately 300-500 words) draws together the research findings from all articles and demonstrates a strong understanding of the different aspects of the research in the bibliography. Any research that complements, confirms or contradicts is noted. References to other studies/literature not in the bibliography may be included. (possible credit points: 3)	
Communication	Mechanics	The bibliography/summary statement follows the guidelines for structure and content. The article is referenced in correct APA formatting. No errors or only one or two minor syntax, typographical or spelling errors that do not detract from the message. The word count for each article is adhered to.		

Communication	Writing	The writing is clear and the annotation is competently constructed. In the summary statement transition phrases (i.e. for example, in particular, furthermore, equally important, for example, similarly, consequently, finally, in conclusion) are used to ensure understanding and ensure smooth transitions between sentences and paragraphs. The level of writing is consistent with that expected at Masters level.		
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Appendix 4.A.3. Rubrics for Assg.2: Action research project

Rubric - Classroom Action Research/Seminar				
Assessment Dimension	Category	Criteria for a Pass	Additional Credit Points	Points Awarded
Knowledge and skills; Research and development	Planning and description	The action research is adequately explained and includes a statement of the problem, the objectives of the activity, the curriculum link, the learning theory that underpinned the activity, and a description of the learners. A link to the literature is evident.	The action research is clearly and completely explained including statement of the problem, objectives, curriculum connection, learning theory, a description of the learners, and evidence of how the planning impacted on the project. A strong link to the literature is evident. (points possible – 2)	
Knowledge and skills; Research and development	Implementing and observing	The implementation of the activity is explained adequately so that a reader can understand how and what was done and what happened.	The results are explained clearly and completely, including such evidence as journal entries, charts, graphs, pictures or children's work so that the readers' understanding of the results is enhanced (points possible – 2)	
Reflective Praxis; Research and development	Conclusions/implications	Conclusions and implications from this activity are presented. These conclusions and implications are adequately and correctly drawn and supported by the data collected and analysed. Recommendations for another cycle of research are included. Adequate links to research literature are evident.	Conclusions are carefully and skilfully drawn and supported by the analysis of the data presented. Conclusions present critical thought, insightful interpretations of the data and link strongly to the literature. Evidence of a clear understanding of this activity is shown by a concise reporting of results including changes/suggestions for further adaptations. (points possible – 3)	
Reflective Praxis	Significance of this research activity	An understanding of the implications of this research activity is shown. Reflection on this activity was employed to evaluate both the activity and the results. Evidence of personal understanding is clear.	Clear evidence throughout that reflection was included in the project from beginning to end. Thoughtful reporting of the significance and implications is evident and implications of the activity have been considered beyond this one situation. Philosophy about ICT and learning comes through. (points possible – 2)	
Communication	Multi modal presentation	The presentation presented the information in a multi modal format that was easy to access, navigate and understand.		
Communication	Mechanics	No errors throughout or only one or two minor syntax, typographical or spelling errors that do not detract from the message. References are placed in correct APA formatting		

Appendix 4.A.4. Rubrics for Assg.3: Position paper

Rubric for position paper					
	Assessment Dimension	Category	Criteria for a Pass	Credit Criteria	Points Awarded
	Literature Reflective Praxis	Topic/Position	The topic is relevant to the use of information and communication technologies to support teaching and learning. The position is carefully considered and defensible within the literature.	The topic has strong relevance to the use of information and communication technologies to support teaching and learning. The position is carefully considered, defensible within the literature and examines a unique, timely or unusual aspect. (points possible – 1)	
	Research Literature	Literature	Good choice of research literature which adequately represents a cross section of ideas and opinions on the topic chosen	Broad choice of research literature which presents an in depth coverage of the aspects of the topic chosen (points possible – 2)	
	Critique and debate Reflective praxis Research	Analysis	Literature is analysed carefully and adequately. Appropriate connections are made between different research approaches, conclusions and interpretations within the literature	Literature is analyzed skilfully and connections are made that present critical and insightful connections between different research approaches, conclusions and interpretations within the literature (points possible – 2)	
	Critique and debated Reflective praxis Research	Argument	The stated position is explored and supported through the literature and different aspects of the position explored. There is a strong link to the literature within the discussion. Opposing views are presented	The stated position is thoroughly explored through a strong link to the literature and the stated position is well supported and defended. Opposing views are incorporated into the argument and critiqued. (points possible – 2)	
	Research	Conclusions	Conclusions are carefully and adequately drawn and supported by the analysis of the literature and the argument put forth in the text of the paper.	Conclusions are carefully and skillfully drawn and supported by the analysis of the literature and the argument put forth in the text of the paper. Conclusions present critical thought and insightful interpretation. (points possible – 2)	

	Rubric for position paper				
	Communication	Structure	The essay follows the guidelines for structure and content. The material is covered in the sections as described in the requirements. References are placed in correct APA formatting. No errors or only one or two minor syntax, typographical or spelling errors that do not detract from the message. Word count of approximately 3000 words is adhered to.	NA	
	Communication	Writing	The writing is clear and the essay is competently constructed. Academic conventions for writing are used appropriately. Transition phrases are used to ensure understanding and ensure smooth transitions between sentences and paragraphs. The level of writing is consistent with that expected at Masters level	NA	